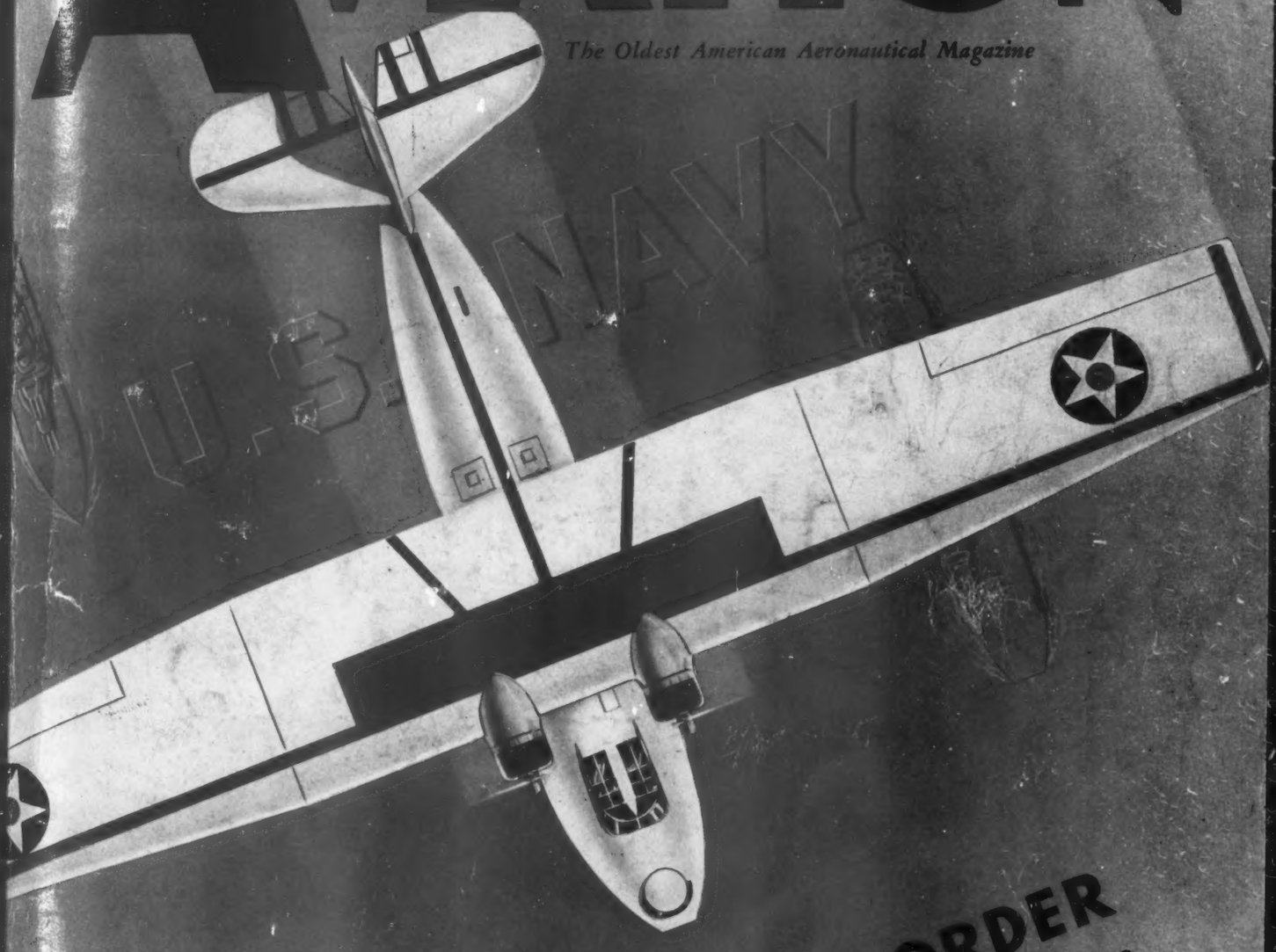
ANNUAL DIRECTORY NUMBER

McGraw-Hill Publishing Company, Inc. FEBRUARY, 1940 Price 35c. per copy

AVIATION

The Oldest American Aeronautical Magazine



NAVY'S LARGEST ORDER

Famous for their mass flights to Alaska, Hawaii, the Philippines, Coco Solo, and Florida, the Navy's twin-engined Consolidated patrol bombers are now doing yeoman service in patrolling American territorial waters. Tried and true, this type has now won the largest procurement order in naval aviation history. And, like all their predecessors, the new PBY-5's will be powered by dependable Pratt & Whitney Twin Wasp engines.

PRATT & WHITNEY AIRCRAFT

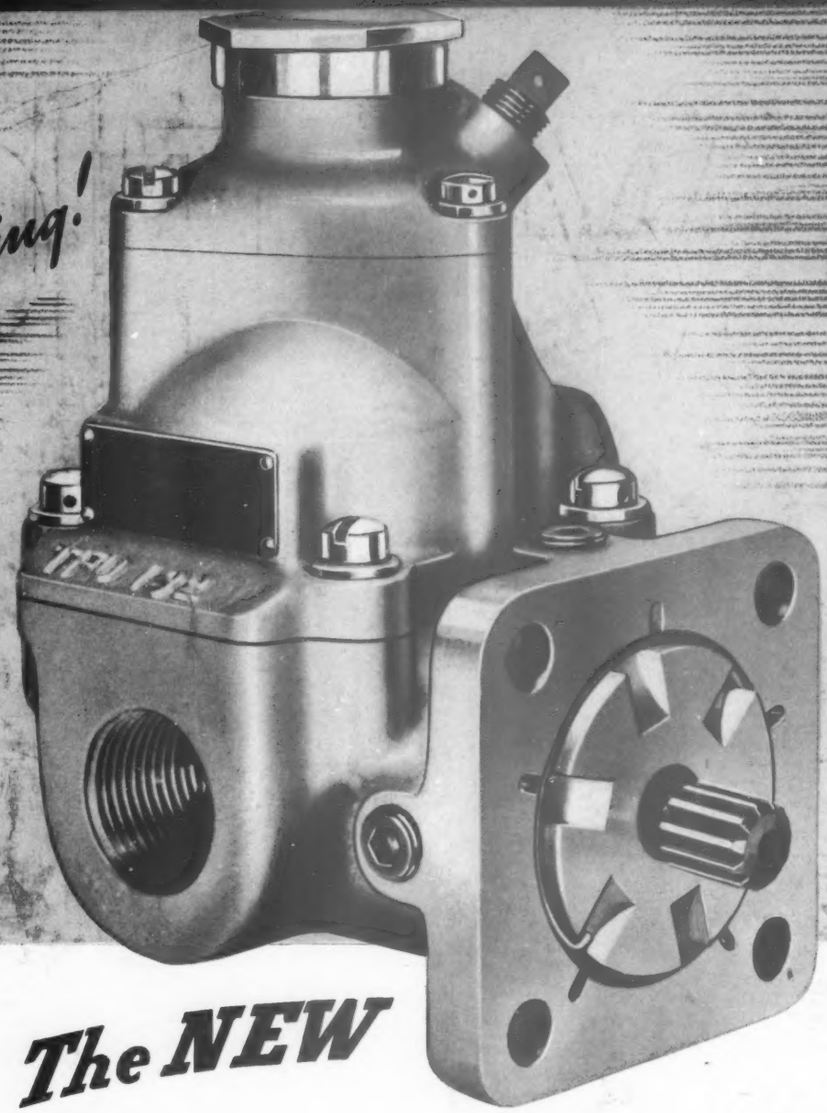
One of the three divisions of

UNITED AIRCRAFT CORPORATION

EAST HARTFORD, CONNECTICUT

PRATT & WHITNEY U.S.A. DEPENDABLE ENGINES

For Safer Flying!



The NEW

Thompson Aircraft FUEL PUMP

★ Provides a non-pulsating, extremely even flow of fuel.

★ Minimizes the possibility of vapor-lock.

★ Has exceptionally low horse-power drag.

★ Made of special materials, light in weight but long wearing.

★ Approved and adopted by the U. S. Army Air Corps.

★ One of over two hundred different parts made by Thompson Products, Inc., for aircraft engine and plane builders.

THOMPSON PRODUCTS, INC.
CLEVELAND • DETROIT

Thompson Products

AVIATION

Established 1916

THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

FEBRUARY 1940

REGULAR EDITION

Contents for Vol. 39, No. 2

Louis Francis Stoll 23
A Tribute by James H. McGraw, Jr.

Flashes 25
Picked Up Along Editorial Airways

Side Slips *By Robert R. Osborn* 29

Light Plane Round-up 30
What the Manufacturers Say about the Low Priced Plane Industry

Here's Where We Are Going 34
A Statistical Study of Civil Aircraft Production and Operation

American Planes and Engines for 1940 36
Pictorial Directory of Civil and Military Aircraft

AVIATION'S Sketch Book of Design Detail 56
Cutaway Drawings and Detailed Perspective Sketches

Engines for 1940 64
Installation Photographs of the latest in Power Plants

AVIATION'S Specifications Tables of Aircraft and Engines 67

Directory of Aircraft and Engine Manufacturers 75
Including Key Personnel

Alphabetical Directory of Accessories and Equipment 80

Classified Directory of Accessories and Equipment 90

Flightray Ready for the Field *By Don Fink* 100

The Aviation News 103

National Aviation 104
National Defense 106
Aviation Manufacturing 108
Aviation Abroad 112
Aviation People 116
Aviation Engineering 118
Transport Aviation 120
Aviation Finance
By Raymond Hoadley 122

Operators Corner 125
Tagging the Bases With Les Neville

Leslie E. Neville, *Managing Editor*
George W. Pfeil, *Manager*
Carl Norcross, *Assistant Editor*
J. Pearce AuWerter, *Assistant Editor*
Donald G. Fink, *Radio Editor*
Blaine Stubblefield, *News Editor*
Charles F. McReynolds, *Pacific Coast Editor*
Paul Wooton, *Chief of Washington Bureau*

IT PAYS TO FLY

McGRAW-HILL PUBLISHING COMPANY, INC.

James H. McGraw, Founder and Honorary Chairman

Publication Offices: 99-129 North Broadway, Albany, N. Y.
Editorial and Executive Offices: 330 West 42nd Street, New York, N. Y.

Chicago, 520 North Michigan Ave. San Francisco, 68 Post Street Los Angeles, 9121 Dalton Ave.
Aldwych, London, W. C. 2
Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta, Ga.

JAMES H. McGRAW, JR., President
HOWARD EHRLICH, Executive Vice-President
MASON BRITTON, Vice-Chairman
B. R. PUTNAM, Treasurer
D. C. McGRAW, Secretary
J. E. BLACKBURN, JR., Director of Circulation

Published monthly, price 35c a copy. Subscription rates—United States, Canada and Latin America republics, $3.00 a year. All other countries $5.00 a year or 30 shillings. Entered as second-class matter September 3, 1936, at the Post Office, Albany, N. Y., U. S. A., under the act of March 3, 1879. Printed in U. S. A. Cable address: "McGrawhill New York." Member of A.B.C.

Copyright 1940 by McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York, N. Y. The following publications are combined with AVIATION: AERONAUTICAL ENGINEERING, AIRCRAFT JOURNAL and THE AVIATION NEWS. All rights to above names are reserved by the McGraw-Hill Publishing Company.

A McGRAW-HILL PUBLICATION

Braniff Super B'-Liners

Miss Jeanne Braniff, daughter of T. E. Braniff, personally directed the completely novel interior styling of Braniff Airways' new Cyclone-powered Douglas Super 'B'-Liners. A harmonious color-scheme in wine, primavera, and sepia is enhanced by large photomurals from the files of LIFE Magazine of scenes along Braniff routes to give an unprecedented effect of spaciousness.

"From the Great Lakes to the Gulf—"

START *the* FLYING '40's *with* WRIGHT CYCLONES

● With a new fleet of Wright Cyclone-powered Douglas "Super 'B'-Liners", Braniff Airways ushers in a decade which the line's president, Thomas E. Braniff, has aptly termed "The Flying Forties". The new 21-passenger DC-3's will augment Braniff's 'B'-Liner service with Cyclone-powered DC-2's, in which Cyclones already have logged over 4,000,000 engine miles.

The Super 'B'-Liners have been especially designed for passenger comfort. The color scheme, appointments and improved soundproofing of the airplanes combine to give them the atmosphere of "a home in the sky".

Again, with the introduction of these ships, the Douglas DC-3 has demonstrated its outstanding position in the transportation industry. Again a major airline has re-equipped with Wright Cyclones.

WRIGHT AERONAUTICAL CORPORATION
Paterson *New Jersey*
A Division of Curtiss-Wright Corporation

WRIGHT *Aircraft* ENGINES

Louis Francis Stoll 1889-1940

LOU STOLL IS GONE. When the daily newspapers told of his passing they spoke of Louis F. Stoll, vice-president and director of the McGraw-Hill Publishing Co. But to those of us who knew and worked with him, he is simply Lou Stoll. He always will be. For as in life no trappings of position ever could stifle the human qualities of the man, even the majesty of death itself never will eclipse our memory of them.

Lou Stoll was the living answer to those who think that business success can be achieved only by sacrificing the human qualities that inspire the affection of others. He showed that competition need not mean enmity, that realism need not mean cynicism, that self-advancement need not imply ruthlessness. He knew how to kindle enthusiasm with no taint of hokum. He was able to make the most of himself without exploiting others.

And Lou *was* successful. He came up the hard way. In his first field of work — automotive publishing — he was a pioneer. He came from Kansas, was graduated from St. Mary's College there in 1909. Soon afterward he joined Class Journal Co., then publishers of *Motor Age, Motor World* and *Automotive Industries*. In 1925 he came to us at McGraw-Hill.

From the first he commanded the respect and liking of his new associates. Soon he was given charge of the Transportation Group of McGraw-Hill papers, which then included *Electric Railway Journal* (now TRANSIT JOURNAL) and BUS TRANSPORTATION. In 1929 AVIATION was added to these. In 1934 he was elected vice-president and director of the company and in May 1939, he assumed the additional duty of directing the company's district office operations.

But all this is no more than a roll of jobs and titles. It does not begin to tell of Lou Stoll and why he will be so sorely missed by us all, especially by those who have been privileged to work close to him.

Every man who ever worked with Lou must be deeply conscious of a debt to him. For it was his good fortune to command the priceless secret of the executive: he knew how to climb while he helped others to climb with him. From his staff he asked nothing for himself. In each of them he instilled but one loyalty — to the day's work. Of them he asked but one effort — the best they could give to the job in hand.

Intelligent and resourceful himself, Lou Stoll knew how to direct intelligence and stimulate resourcefulness in others. He was no credit-grabber, never picked the brains of others for his own advantage. So no man who worked with Lou Stoll ever shrank from giving him all he had. His men trusted Lou. And today those closest to him are wondering what it is going to be like without the warmth of his friendship, the encouragement of his counsel and the inspiration of his fine enthusiasm for the day's work. They know they have lost something real.

But Lou Stoll will be mourned beyond the ranks of his immediate associates. For his leadership found scope in even broader fields than his own staff and his own company. In the councils of every industry that he served as publisher he was welcome as a valued counsellor. The leaders of those industries knew him well: they respected his understanding and trusted his judgment. No finer tribute can be paid to a business publisher. Lou earned that tribute.

Scarcely second to his capacity for leadership was his unusual talent as a constructive salesman. He knew how to build good-will as he built business. He knew his stuff; that goes without saying. And he could be forthright without presumption, aggressive without arrogance, friendly without familiarity.

And when Lou went out to sell he always appraised whatever he might have to offer in terms of the buyer's problems. He talked the buyer's language, thought his thoughts, was considerate of his viewpoint. Today none mourns his passing more sincerely than the man with whom he has done business as salesman with buyer. For he too knows the real Lou Stoll. He too respected and trusted him. And he too knows that he has lost something very real.

So we are grateful to Lou for leaving us the proof that business and friendship are not things apart, that success does not preclude a decent consideration for others, that strength and gentleness are not alien to each other. For in all these he excelled. And the memory of his excellence will abide with us always.

So goodbye, Lou! The last few months, we know, have been tough going. And as we watched from the shore, we have suffered to see you threading so gallantly those broken waters just off the beach. But now you're clear. And I seem to see you as I left you last time we were together on your "Blue Water". You stood on deck, swinging on a stay as you waved goodbye to me. And now you're clear, headed into blue water and the sunset.

We're going to miss you, Lou — far more than words can tell.

James H. McGraw, Jr.

PRESIDENT, McGRAW-HILL PUBLISHING CO., INC.

RELY ON REPUBLIC!

REPUBLIC EP-1 PURSUIT AIRPLANE FOR THE ROYAL AIR FORCE OF SWEDEN

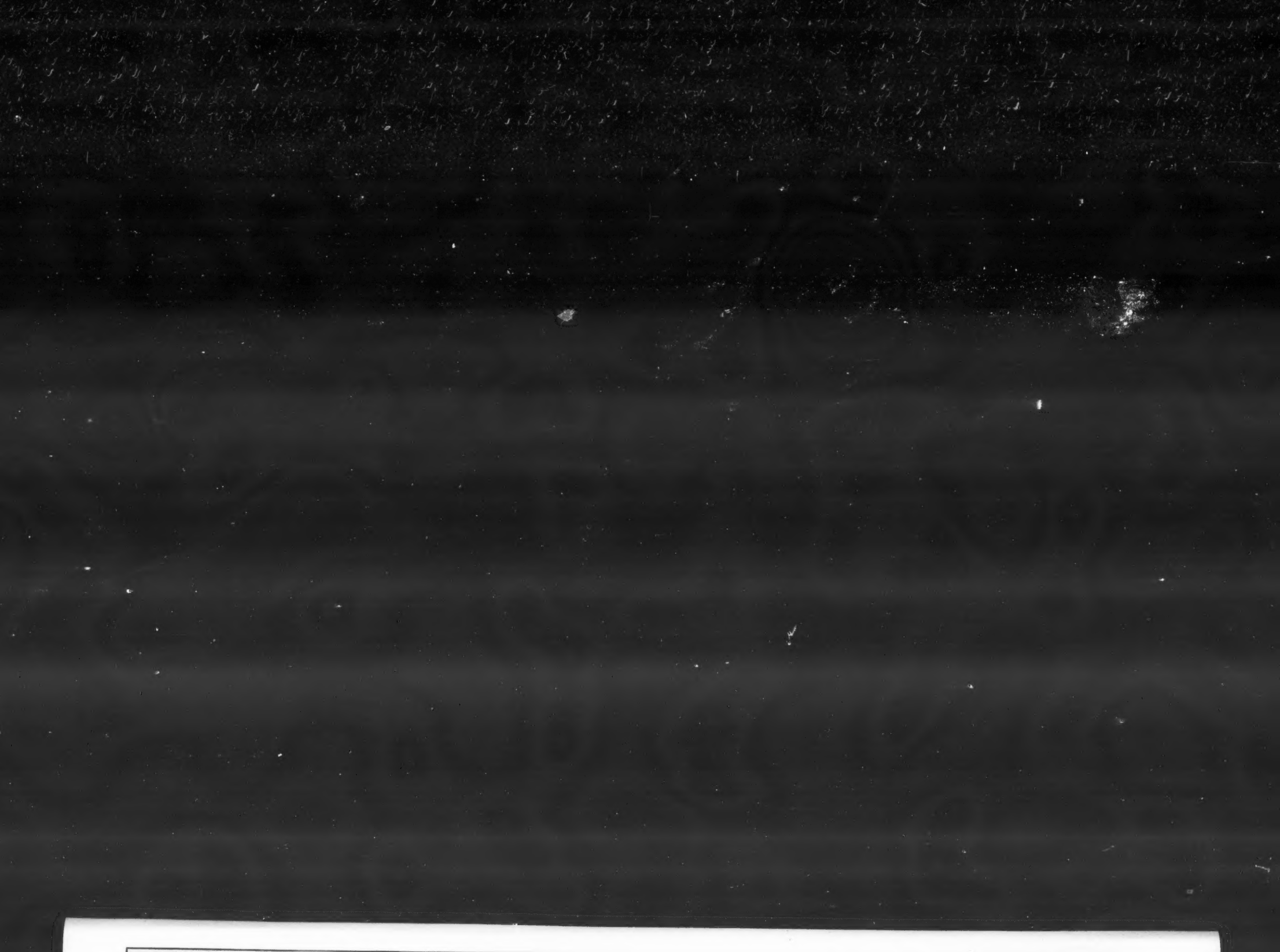
PEERLESS PURSUIT AIRCRAFT INSURE NATIONAL SECURITY against aerial bombardment and are a first essential to modern air defense. ● Five Nations have equipped their air forces with our airplanes. ● REPUBLIC advances in design and construction are continuing today on an accelerated scale to meet new demands for speed, stamina, range and performance.

REPUBLIC AVIATION CORPORATION

(FORMER NAME: SEVERSKY AIRCRAFT CORPORATION)

FARMINGDALE, NEW YORK, U. S. A.

CABLE: REPUBAV



»
IN
not
the
sho
our
sho
bec
rem
The
loss
the
he
we
nes
gav
T
Cor
Wis
care
lin
seve
scho
post
expe
boxe
wor
him
mad
enro
of N
porte
Illin
By
try
work
the
whic
engi

Flashes

Picked Up Along Editorial Airways

» AVIATION IS STILL A YOUNG MAN'S INDUSTRY. Even the old-timers are not so very old. And that is one of the reasons why we are so severely shocked when death comes to one of our veterans. We were doubly shocked in the case of Don Brown, because of his personal charm and his remarkable talents in manufacturing. The industry suffers a really great loss in having him taken from it at the early age of 49 and at a time when he was much needed. The last time we saw him was before his last illness. He was congenial as usual and gave no hint of failing health.

The President of United Aircraft Corporation was the son of a Berlin, Wisconsin, stone cutter and began his career by carrying papers for the Berlin Evening Journal at the age of seven. After graduation from high school he went to work in the local post office. His first manufacturing experience was building rural mail boxes in his home town. But the world looked bigger than Berlin to him and when he attained majority he made his way to Chicago where he enrolled in the School of Commerce of Northwestern University and supported himself by employment in the Illinois Steel Company.

By this time the automotive industry was booming and Don went to work in the production department of the Simplex Automobile Company, which built Hispano-Suiza airplane engines for the French Government in 1915 and was reorganized to become the Wright-Martin Aircraft Corporation in 1917.

After a brief interlude he returned to aviation in 1921 as Assistant Factory Manager of the Wright Aeronautical Corporation and here he became closely associated with Frederick B. Rentschler, now Chairman of United Aircraft's Board. In 1925 they were among the founders of the Pratt & Whitney Aircraft Company in Hartford, and Brown was made factory manager. By 1929 he became a director and vice president in charge of manufacturing. In 1930 he was elected president.

Reaching still higher he was elected vice president and a director of the United Aircraft and Transport Corporation in 1932 and when it became the United Aircraft Corporation in 1934, he was elected president.

The twice enlarged Pratt & Whitney engine factory, now covering more than a million square feet; 500-acres Rentschler Field; the busy Hamilton-Standard Propeller factory; and the newly-enlarged Vought-Sikorsky plant at Stratford, Conn., are among the many monuments to Donald Lamont Brown. He was also a Governor and Member of the Executive Committee of the Aeronautical Chamber of Commerce, a member of the Institute of the Aeronautical Sciences, and a director of several Hartford business institutions.

Among the many tributes from industrialists, Government officials, and men in high places in our national defense, was one from President Guy Vaughan of the Curtiss-Wright Corporation. It follows:

"The passing of Donald L. Brown, the president of United Aircraft Corporation, is an irreparable loss to the industry and a great sorrow to all of his friends. As a pioneer of aviation, his contribution has probably been greater than that of any other man of his age. The rapid and efficient development of United Aircraft stands as a monument to his work."

Donald Lamont Brown

THE INTERCONTINENT CORPORATION

Leading Exporters of
American Aeronautical Products

30 ROCKEFELLER PLAZA
NEW YORK CITY, U. S. A.

CABLE ADDRESS
INTERAERO, NEW YORK

To AVIATION's Readers:

With this issue the masthead of your magazine undergoes considerable revision. After some months of prearrangement and planning to eliminate any sudden change in policy or performance, the editorial chair has been turned over to Leslie Neville as of January 1, 1940. Elsewhere in this issue will be found an account of the locale and the duties of my new assignment. But this is in no sense a "farewell". My new duties will undoubtedly bring me into close and frequent contact with many of you. I do want to take this opportunity, however, to thank you all for the support that you have given me during my years with AVIATION.

The magazine is passing into excellent hands. Les Neville has had many years of experience both in aviation and in publishing, and I confidently foresee a great future for AVIATION under his able leadership. He is backed up by an editorial staff whose members have been selected for their competence in the many fields that aeronautical magazines must cover. We may look forward to a continuation of the service that AVIATION has given to the aviation industry and the aeronautical sciences all over the world during an honorable and unbroken career that is now within a year of the quarter-century mark.

S. Paul Johnston.

To our readers:

Since the last issue of AVIATION we have lost our publisher and changed our editorial staff. Our holiday season was saddened by the death of a brilliant publisher and a firm friend, and it is still difficult to realize that Lou Stoll will no longer be with us to help us over the rough spots with his long experience and instinctive ability to sense the reader's needs. Many a future decision will be made on the basis of how Lou would have done it. But we must carry on and Lou's responsibilities will be assumed ably by George Pfeil, whom many of you know and who pinch-hit so well for Lou during his long illness.

Paul Johnston has left us to take an important post with the National Advisory Committee for Aeronautics. A unique combination of qualifications was required for the performances of the duties of the Coordinator of Research. Paul's experience fitted into the pattern perfectly. It would have been contrary to the broad interests of the industry for us to attempt to stand in his way.

His departure leaves in my hands grave responsibilities of editorial direction of the oldest American Aeronautical Magazine.

There will be no sudden changes in editorial policy, but our efforts will continue to be directed toward constant improvement and growth. AVIATION will continue to be dedicated to the needs of its readers. Our offices and our pages always will be open to you, and your problems will always be our problems.

Recent industry expansion has created new problems in personnel training, production, and equipment maintenance. Accordingly we have strengthened our staff by the addition of Carl Norcross, specialist in these fields and author of many publications, including the book "Getting a Job in Aviation". Mr. Norcross has made a study of the maintenance bases of the major air lines, and of numerous factories.

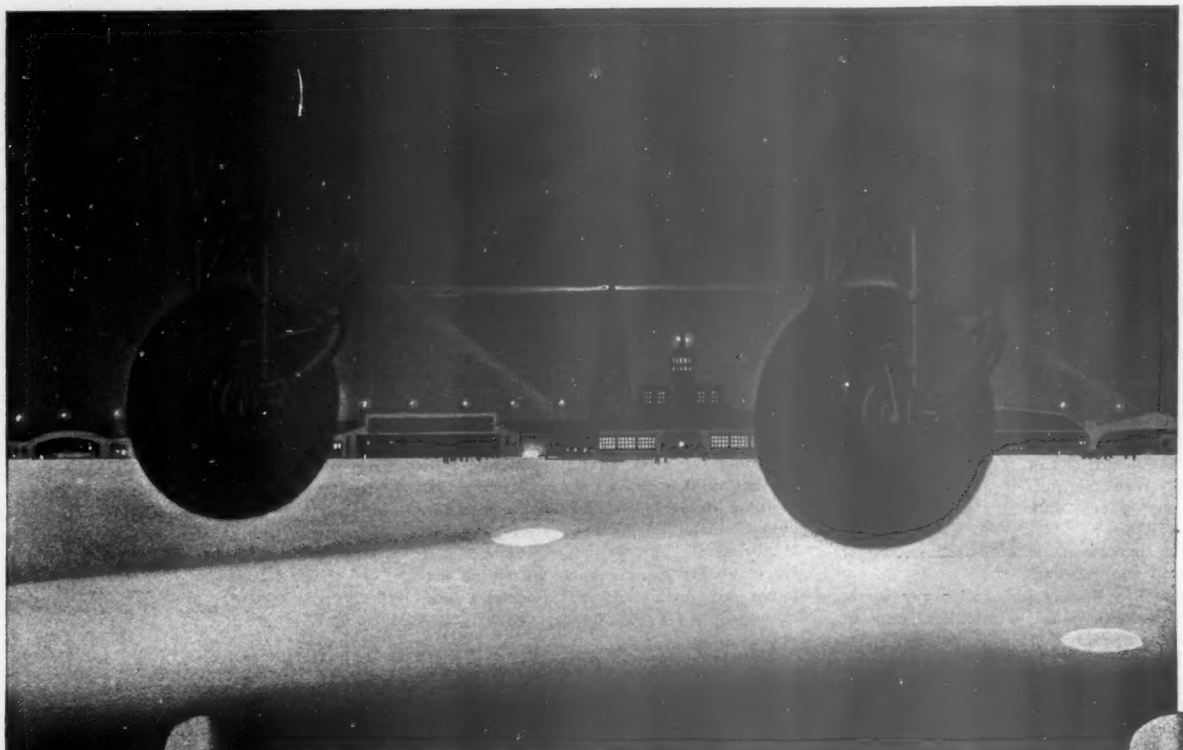
Among the new features in this issue are AVIATION's Sketch Book of Design Detail (page 56) which enables engineers to get under the skin of the airplanes we describe and visualize their noteworthy design features by perspective and cutaway sketches. Another innovation for engineers and many others is the Concentrated Specification Tables, which provide complete design characteristics, dimensions, and performances for all American airplanes in current production in one compact unit.

For financial readers we offer a new column by Raymond Hoadley, who summarized last year's activities in his field in the January issue.

You will find other changes in reading through this issue of AVIATION and there are many more to come. We hope you'll like them. But whether you do or do not, please write in and let us know because we cannot publish your magazine without your guidance.

Leslie E. Neville

Maguire found her address in Aviations Annual Directory Issue



Airplane Products:

BRAKE WHEELS
High and Low Pressure "Streamline" Smooth Contour

TAIL WHEELS
Low Pressure "Streamline"

AXLES
For All Wheels

BRAKES
Mechanically and Hydraulically Operated

OPERATING CYLINDERS FOR HYDRAULIC BRAKES

TAIL WHEEL KNUCKLES
For "Streamline" Wheels, Steerable and Swivelable with Shimmy Dampener

PNEUDRAULIC SHOCK STRUTS
Designed and Tested to Meet Individual Requirements

PILOT SEATS
Standard Army and Navy Type

Engineering Information is Available to those Interested

BENDIX PRODUCTS DIVISION
OF BENDIX AVIATION CORPORATION • SOUTH BEND, INDIANA

BENDIX

AIRPLANE WHEELS · BRAKES · PILOT SEATS · PNEUDRAULIC SHOCK STRUTS

Side Slips

By
ROBERT OSBORN

» THE twin-engined monoplane made a long, low approach over the golf course toward a landing on the old Curtiss Field on Long Island. Presently the test pilot saw that he had misjudged his glide, and that a burst from the engines would be necessary to get the ship into the field. He reached over and shoved both throttles forward. One engine caught but the other sputtered and coughed, and the ship suddenly slewed around, dropping one wing back of a bunker. The airplane cart-wheeled, wiping off both wings and landing gear neatly, and leaving only the fuselage sliding along on its side. When the bouncing around had more or less subsided, the pilot slid back the side window, which was above him, climbed out, and then reached inside to help the stunned engineering observer who had been riding with him. "Come on, Perk," he said, "we have to walk in from here."

The pilot was Paul Boyd, one of the most remarkable test pilots it has been my pleasure to know and work with. Always calm, and seemingly never disturbed by any happening, no matter how startling it might have been to an average person. Paul was once riding with another pilot, who had come to check out an airplane before taking delivery for an airline. Unfortunately, in the work which had been done the night before the ailerons had been crossed in the process of rigging and a gust dropped one wing almost as soon as the ship left the ground. When the ship was standing on its beam ends about twenty feet in the air, ready for the complete washout which didn't even scratch anyone on board, Paul's only comment was "Oops! Here we go."

Another time, Lloyd Child, now famous for his six-hundred-mile-an-hour diving speed mark, was riding with Paul as observer for the test of a single-engined ship. Just as the ship left the ground, headed for that corner of Curtiss Field which was so beautifully landscaped with hangars, Operations Offices, lunch wagons and high-tension lines, the engine started cutting out. There was plenty of time to cut the gun and go back for another start but Paul calmly started testing the magnetos to see which one was the cause of the difficulty. As they staggered over the wires at the end of the field, Paul called over to Lloyd, "Make a note that the left mag needs some checking."

Paul was far less talkative than the average clam, and when he made a report on his flight testing it was always brief, to the point, and made to the Chief Engineer, the only proper authority, to his way of thinking. The Army, Navy, the Dept. of Commerce, the President of the Company, and the Project Engineer could get the information from the Chief Engineer if they wished, but not from Paul. Curtiss Field pilots won many a bet with newcomers that they couldn't get any information from Paul on any subject at all. Captain Bender, of Mitchell Field, told about the time he saw Paul coming out of the Air Corps weather office and couldn't even find out from him what the official weather prediction had been.

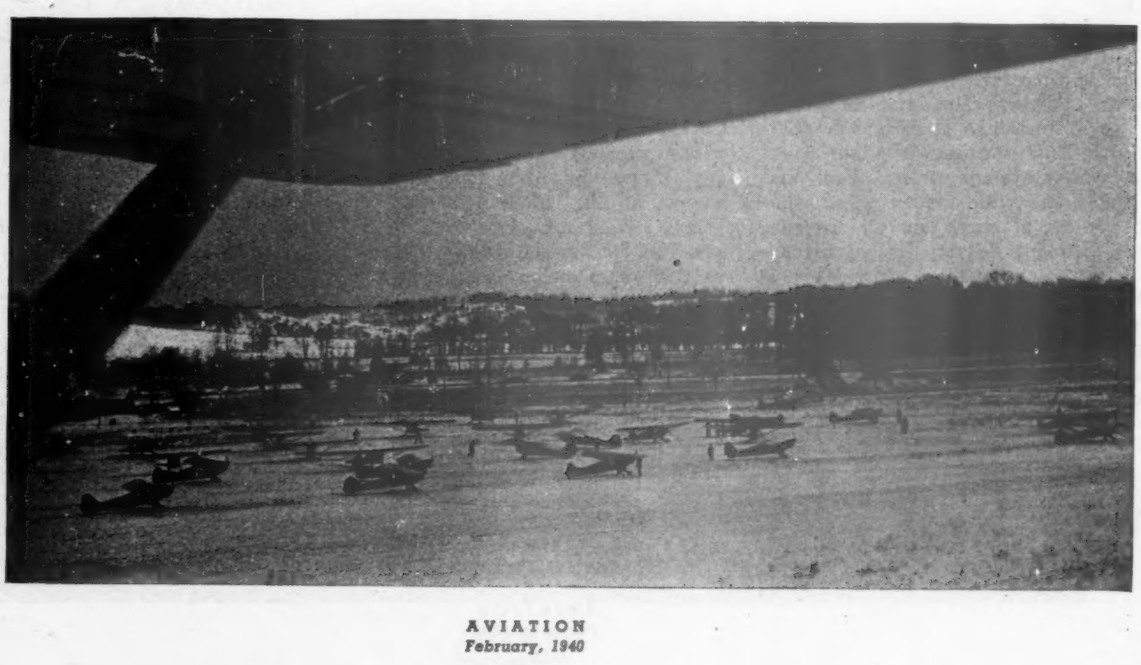
In between terms in the Engineering School of the University of Minnesota, Paul barnstormed a Jenny around the countryside, following the Fair circuit. One day a Patent Medicine salesman hired Paul and his ship as an added attraction for his usual show. In accordance with the agreement Paul landed inside the race track oval at a Fair and the salesman proceeded to hawk his wares, standing in the rear cockpit of the ship, while Paul, properly helmeted and goggled, served as the attraction in the front cockpit. Business was good for a while but the crowd grew increasingly restless, demanding that a flight be made. Finally the Patent Medicine man realized that the time had come for action, instead of further sales talk, so he settled himself in the rear cockpit and said, "All right, my man. Make a flight."

This was an unexpected turn of events for Paul, as he had flown the ship in light and had intended to take it out that way. However, he considered the length of run available, the height of the race-track fence, and the added two hundred and twenty pound weight in the rear cockpit, and decided he could make it. He did make the fence all right, but the day was hot and the Jenny was lackadaisical in the matter of climb, as Jennies often were, and Paul flew several miles without being able to add altitude over the height of his first obstacle,—the fence. Finally there was a continuous row of houses coming up, and the only solution to that problem Paul could work out was to stick the nose of his ship between two houses and let nature take its course. The wings were sheared off neatly and the fuselage mowed down a picket fence and sundry shrubbery between the houses, before bouncing to a stop on the lawn of the house across the street. Paul unbuckled his belt and turned quickly to see what he could do to help his passenger, but that urbane gentleman was already standing up and had his hand in his trousers pocket. "All right, my man," he said. "What do I owe you?"

Paul was doing his testing in the days when speeds were rapidly increasing with each new design, and "flutter" was just beginning to be an important engineering problem. Very, very little was known about flutter in those days,—the only procedure available was to fly a new design to see if it was susceptible. On one new airplane Paul discovered a very serious flutter,—sudden and destructive. He never was able to report to the company on that experience, for Death came to Paul Boyd on that flight, as it must eventually to all of us whether we are test pilots or groundlings. However, knowing Paul's character, and honesty, and his Code, no sacrilege is involved in saying that we were sure Paul made his report to the Proper Authority.

Summer weather, such as this in Palm Beach, was the goal of some 600 pilots who flew to Florida in the recent Cavalcade.

Staked down for the night at Alexandria, Virginia, after a busy day of flying.



AVIATION *for February, 1940*

LIGHT PLANE *Roundup*

THERE have been mass movements in America before.

Our fellow countrymen have always been a dynamic people, pushing ever westward, subduing the prairies of the middle states, the great plains of the southwest and finally conquering the rich frontiers of the West Coast. Although we have been on the go for generations, there never has been such a mass movement of wings as took place recently in the flying cavalcade to Florida.

Six hundred airplanes roaring into Miami are a symbol of the light plane boom of today—the greatest boom of privately owned airplanes in the history of aviation. Some 3,500 of these ships were built last year, approximately doubling production for the preceding year. The light plane industry has definitely come of age.

The public's interest in flying is nothing new. It has been in the blood for a long time. But, in the past, interest could not mean ownership because both flying lessons and airplanes cost too much for the average purse. Now, however, interest is being translated into action. The public is learning to fly—and is buying planes to fly in.

So the airplanes had to come first. You can't have a flying boom without the right ships. Light planes of today are delivering a brilliant performance far surpassing that of a few years ago. Prices are low, safety is high. Modern airplanes are rugged, sturdy, dependable machines. Speed is sufficient to take you places in a hurry.

These are no longer merely "airport" planes. You are not confined to flying about your own back yard when airplanes will take you many miles cross-country in a day. You know your engine can be depended upon when a stock model will purr smoothly in the air for more than four weeks. You know that sturdy performance is built into these light planes when they have been flown coast-to-coast non stop. Operating expense is not a worry when your ship consistently gives you 25 miles to a gallon of gas.

But the best proof that these light planes can take it lies in the results achieved by the Florida cavalcade. *That* was something!

Next morning there was snow on many wings and flying weather that day proved both pilots and ships had plenty of stamina.

Spectators along the routes rubbed their eyes in amazement at the hordes of planes settling down on the fields.

For forecasts of the immediate future we turn to the heads of the five leading manufacturers of light airplanes. They are uniformly optimistic. Assuredly the light plane business is no bubble to vanish into thin air. It is with us to stay.

Here they are! We pay our tribute to the men who have made the light planes possible—the designers—the builders—the engine and accessory manufacturers—and the men who make the sales!

1,800 Cubs a Record

By W. T. Piper

President,
Piper Aircraft Corporation

ABOUT 1800 Cubs rolled out of our Lockhaven plant in 1939. That's a lot of airplanes when you figure that it is twice as many as all the two to four-place ships produced in the entire country as recently as 1935.

Our largest seller was the J3 Trainer with a 50 h.p. engine. This model, with other 50 h.p. types, made up about three-quarters of our total production. The balance was Cub Coupes with more powerful engines.

During 1939 school operators were our largest customers, taking about 85 per cent of our airplanes. This

W. T. Piper

year we again expect the bulk of our output will go to the operators. But we believe that in 1941, sales to private owners will increase so that they will take half our ships.

The Piper sales organization is based on the distributor-dealer plan. This gives us a well qualified man in each district. We try to give complete cooperation to our distributors and expect them, in turn, to cooperate with the dealer.

For 1940 we have announced better airplanes for less money—with better designing and better engines. In addition to our well-known models we have the new three-place Cub Cruiser, from which we expect fine things. Through greater use of tools, jigs and dies we have improved factory methods to produce our ships more economically—and our buyers get the benefits.

Although we have been fortunate enough to lead the field in volume of sales, we know that only a few airplanes have been sold compared with the vast potential market of the next few years.

New Trainer—New Plant

By Carl Friedlander

President,
Aeronautical Corporation of America

AERONCA built and sold more than 600 airplanes last year, which is about double our production figure for 1938. We expect a 50 per cent increase this year.

Private owners and dealers each took about one-third of our output, with flying schools buying about 18 per cent, foreign countries about 10 per cent, and the rest going to flying clubs. Whereas one-third of our ships in 1938 were equipped with 40 h.p. engines, and the balance with those of 50 h.p., in 1939 only 19 of our airplanes had 40 h.p. engines, 279 had 50 h.p. equipment, and 304 were provided with engines of 65 h.p.

The Aeronca distribution system is set up on a district manager, distributor and dealer basis. The chief advantage of the system is that these people are operators and the average person who buys an airplane wants the kind recommended by someone

Carl Friedlander

experienced in aviation. As the airport is the place where the ship is demonstrated, we prefer to deal through successful operators.

This year we are introducing a new model—a 50 h.p. tandem-type trainer. The new ship is designed to meet an existing market. It should open up to our dealers and distributors a new field and provide stimulus for increased sales. Our engineers are working to decrease production costs without sacrificing any of the fine qualities built into Aeronca ships.

Production facilities were taxed last year. We plan to expand them in 1940 by building a new factory and office building in Middletown, Ohio, where we will have approximately 60,000 square feet, including an experimental shop and a storage hangar. In the past our greatest success in cutting production costs has been through the installation of machinery to replace hand operations. This policy is to continue in our new plant.

The industry is making continual progress. In the near future our present production records will be something to smile over.

Factory Still Growing

By C. G. Taylor

President,
Taylorcraft Aviation Corporation

AS I look back on the year 1939 I realize that the major problem of our company was one of developing more salesmanship among our representatives. Good salesmen in the aircraft field are scarce. While our ships are steadily improving, even a good airplane will not sell itself. Skillful salesmen are also needed.

Air cruises are a definite help to our sales forces as they build up the utility of the airplane and take it out of the stunt class. We have always backed air tours and whenever possible have joined them ourselves.

Last year approximately 480 Taylorcrafts were sold. About 295 were 50 h.p. ships and the balance were of 65 h.p. We judge that from 60 to 70 per cent of our airplanes are purchased on time payments, the bulk of them going to private owners.

Our production facilities are inadequate and we anticipate expanding them for 1940. We now have about 22,000 square feet of floor space. This crowds us and we have been working our dope shop two shifts. We have been putting out the most airplanes per square foot of factory space of any light plane company. To start a company and develop it brings

C. G. Taylor

plenty of problems, and our combined efforts have been used extensively to solve them and to cut production costs and ultimate bottle necks.

Our sales system is on a distributor-dealer basis. This has worked well with the minor exception that some distributors have territories that are too large for them to handle efficiently. We also find that state lines are poor outlines for distributors' territory. Trade areas form better boundaries.

In 1940 we estimate that we will produce more than 500 ships—the bulk of them being of 65 h.p.

Winter Production Up

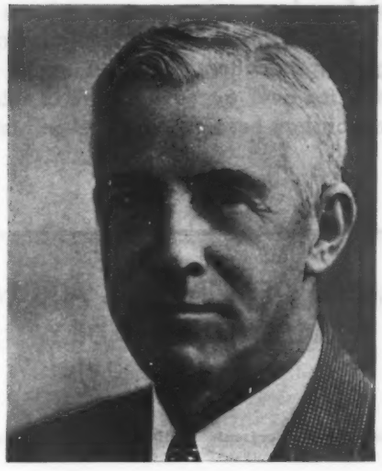
By J. H. Torrens

President,
Luscombe Airplane Corporation

PROSPECTS for the light, all-metal airplane are decidedly good for 1940. Last year we sold 285 airplanes—but in 1940 we should sell at least 500. About 90 per cent of our output is equipped with 65 h.p. engines, the balance with those of 50 h.p. There are now about 175 schools using Luscombes for instruction purposes and this accounted for approximately one-half of our 1939 sales. In 1940 however, we anticipate that 80 per cent of our ships will go to private owners.

One reason for our optimism is that winter sales are holding up exceedingly well. In December, when sales of light airplanes usually fall off, we received as many orders as during our most active summer months.

Last year we put up a new building which increased our floor space to 118,000 square feet. This enables us to build two airplanes per day. To cut production costs we are constantly studying the advisability of making parts here instead of farming them out, and to this end we have recently added a large supply of new equipment. A new graphic control system has given us a better check on production. We have also classified our factory staff and taken steps so that their work comes through at uniform speed. The Luscombe was designed with future production problems in mind. We are attempting at all times to simplify our design so that production is largely a matter of stamping and assembly.



J. H. Torrens

Luscombe distributors are airplane-sales minded and have adequate capital to handle trade-ins, and to advertise and merchandise our airplane properly. Maximum discount is not given until the sale of three ships within a specified time limit. Territories are not closed until a distributor proves his ability to produce sales in keeping with the productivity of the territory. This year we plan to use a more personalized sales contact by factory or territorial salesmen.

We feel sure that the light plane business is only scratching the surface of its potential market. We believe that the public is now beginning to take private flying seriously and we expect that in two years the light plane market will be more than 75 per cent above what it is today.

Big Six Months

By W. A. Mara

Vice-President,
Stinson Aircraft

WITH the introduction of its 105 last June, Stinson entered a new phase in its production history. The new plane received a warm and immediate response throughout the country.

W. A. Mara

While a few were delivered in June, we did not really get into production until July. By the end of December we had sold 264, which, we feel, is a good showing for a brand new ship.

About one-third of the 105's were delivered to distributors and dealers, a number of the latter being operators as well. The rest went to individual owners.

The company sells through distributors, which we appoint. The distributor in turn appoints his own dealers. We have closed territories and we also have regional sales managers employed by the factory whose job is to appoint the distributor and work with him to increase sales through proper methods of education and promotion. Outside of general advertising, and possibly some national advertising, our promotional activities will run to a more intensified working of each particular territory and the use of direct mail.

Our new Nashville plant will permit us to triple our production facilities during 1940. To lower cost and secure standardization of parts we have completely tooled the 105. For this tooling we spent approximately $150,000 on new machine tools of various kinds. Part of last year we employed three shifts in the factory but we want to avoid that again if possible. Our experience proved that the second shift was not as efficient as the first day shift, and that the third was least efficient of all.

Our buying of raw materials is based on selling at least 500 of the 105 model this year. By providing better airplanes at prices that an ever increasing number of people can pay, the aviation industry is definitely moving towards a time when the light plane business will assume great importance.

HERE'S WHERE

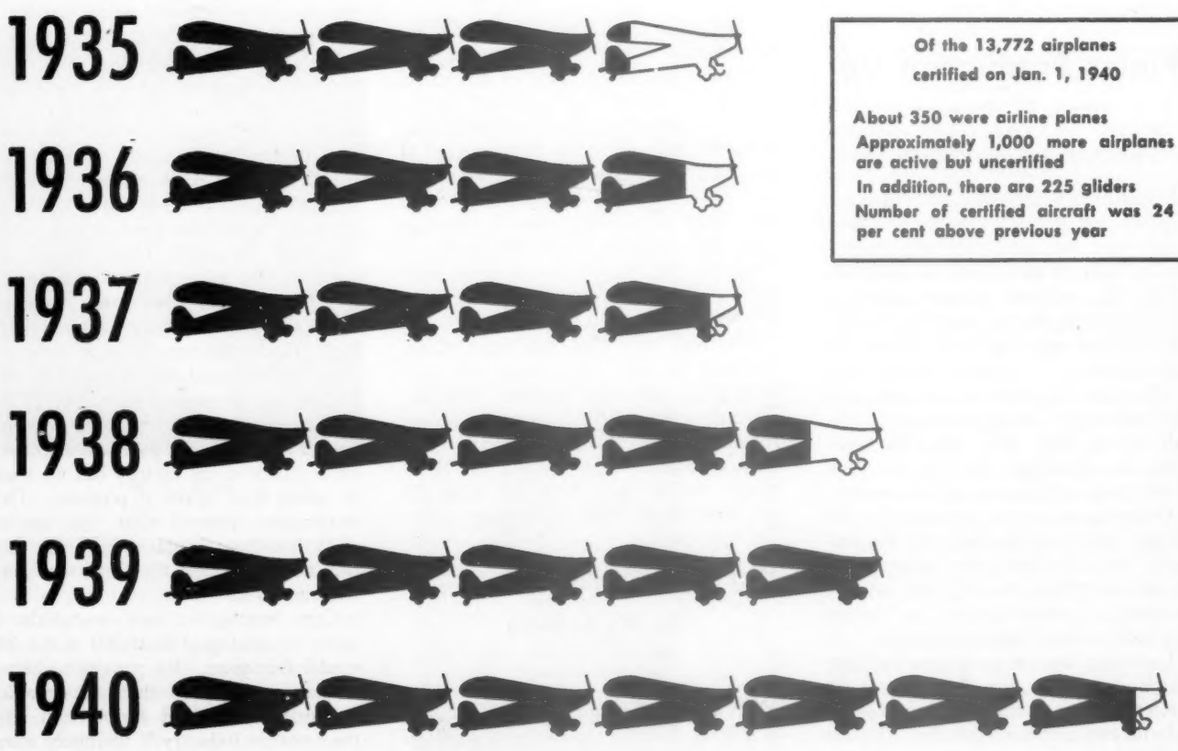
Greatest Year for Civil Aircraft Production

Although producers of American military aircraft have been given the center of the aviation stage, manufacturers of civil airplanes are also driving ahead to achieve a new high in production. Unlike Europe, where there has been almost no private flying for over a year, growth in this country in both civil planes and their operation has been the greatest in history.

VOLUME OF CERTIFIED AIRCRAFT INCREASES STEADILY

Each figure represents 2,000 certified airplanes

Jan.1



Of the 13,772 airplanes certified on Jan. 1, 1940

About 350 were airline planes

Approximately 1,000 more airplanes are active but uncertified

In addition, there are 225 gliders

Number of certified aircraft was 24 per cent above previous year

WE'RE GOING

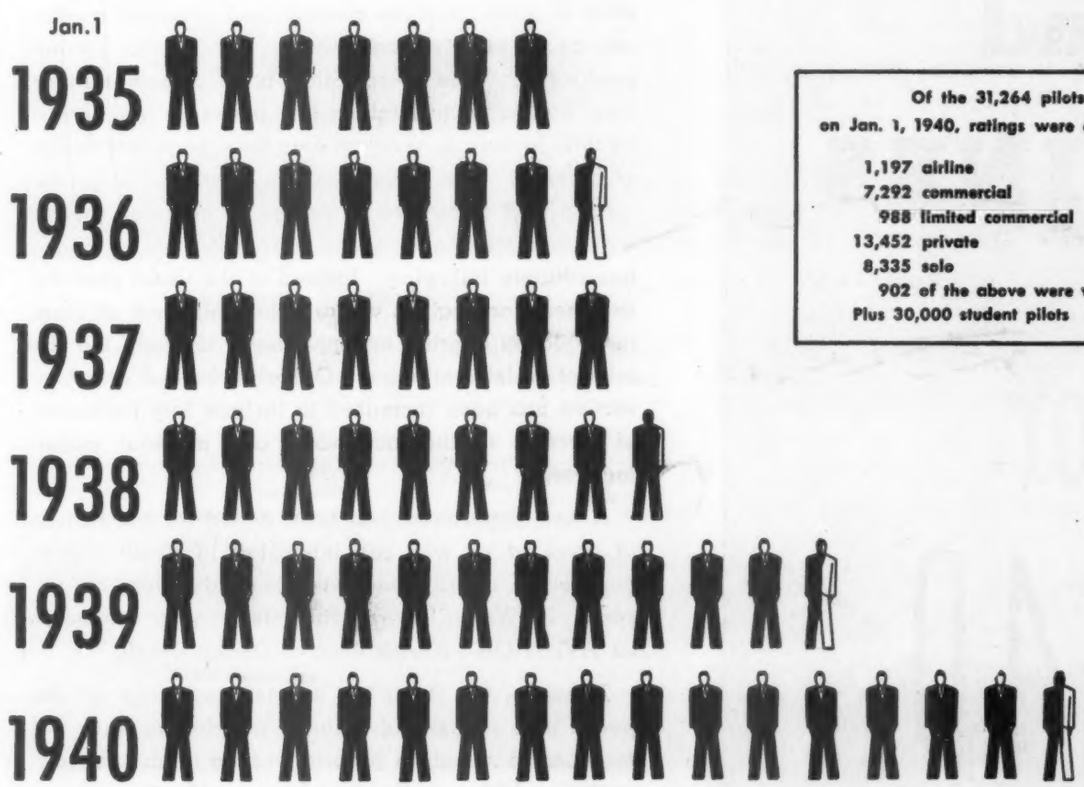
Civilian Pilots

Are Taking to the Air

Number of pilots has been growing steadily in recent years, reaching a peak on Jan. 1, 1940 which was 37 per cent above figure for the preceeding year. With the helping hand of the C. A. A. flight training program, new pilots receiving certificates this year should number between 10,000 and 20,000. Growth should be rapid for several years.

TO OPERATE OUR CIVIL AIRPLANES, WE HAVE A GROWING FORCE OF PILOTS

Each figure represents 2,000 certified pilots



Of the 31,264 pilots on Jan. 1, 1940, ratings were as follows:

1,197 airline
7,292 commercial
988 limited commercial
13,452 private
8,335 solo
902 of the above were women
Plus 30,000 student pilots

American PLANES and ENGINES for 1940

IN THIS PERIOD of great activity in all branches of the industry there is no time to pause for a display of wares. Few of us have taken time out even to think about a general air show this winter. Nearest approach was the recent Air Corps exhibit in Washington which was an excellent display of military equipment but necessarily lacked representation of the civil aircraft manufacturers.

With these ideas in mind we have attempted to make our Annual Directory Issue more than ever a show in print. In it are concentrated complete specifications of all civil and military aircraft in current production. This presentation is in a new tabular form and is packed into a few pages so that it will be unnecessary to seek out data from page after page of material. For those who are interested in photographs and three-view drawings, a pictorial section with abridged specifications is provided on the pages immediately following. Instead of the usual pictorial treatment for engines we are showing most of them in airplanes offering an opportunity to study the details of their installation. Our alphabetical directory section has been increased to include key personnel of aircraft, engine, accessory, and material manufacturers.

A new department has been added for the benefit of those of us who are interested in detail design features of aircraft and wish to study them in perspective. We will await with interest your comments on AVIATION's Sketch Book of Design Detail.

Although this issue is devoted primarily to the peace time pursuits of aviation people, we have not forgotten to include a pictorial section on military aircraft in addition to the complete specifications.

We hope you will like it.

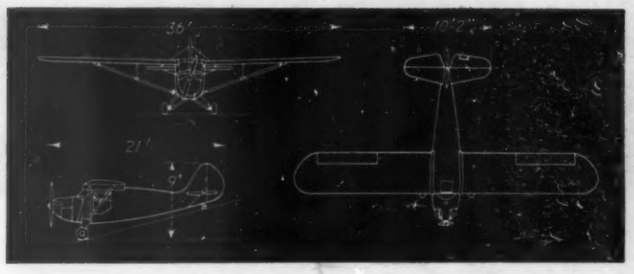
AIRCRAFT of 1 to 3 SEATS

For complete specifications see page 69

Aeronca 50-F

A.T.C. 688

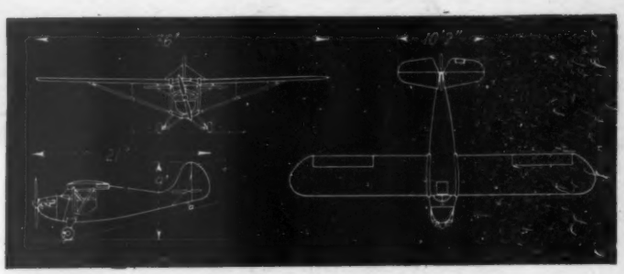
THE AERONCA 50-F, 50-L or 50-LA two seater is powered with a Franklin (50-F) or Lycoming engine rated at 50 h.p. It has a high speed of 95 m.p.h., and cruising speed of 88 m.p.h., with service ceiling of 13,000 ft., and normal range of 250 miles; climb, 15,500 ft. per min. It is built on dimensions of 36 ft. span, 20 ft. 8 in. to 21 ft. length, 9 ft. in height, with a gross weight of 1060 lb. Price $1,565-$1,695 at the factory.



Aeronca 50-C, 65-C

A.T.C. 675

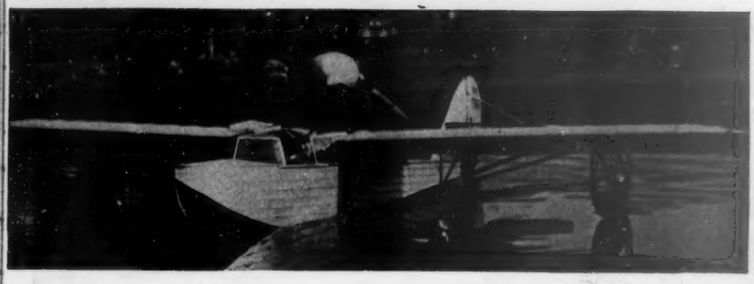
THE AERONCA 65-C or 65-LA is a two-place closed monoplane powered by a Continental or Lycoming 65 h.p. motor. It has a top speed of 102 to 105 m.p.h., cruises at 95 to 98 m.p.h. Service ceiling is 14,000 to 15,000 ft., and normal range is 250 miles. Climbs 600 to 650 ft. per min. at sea level. Dimensions: span, 36 ft.; length overall, 21 ft. 1 in.; height overall, 108 in. Fixed landing gear. Spars and ribs of spruce covered with fabric. Hull of welded steel and fabric.



Akron Funk Model B

A.T.C. 715

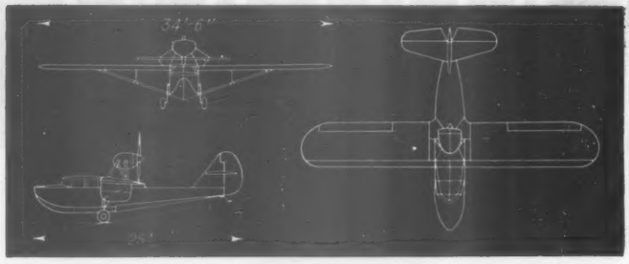
AKRON offers the Funk Model B at $1,950. It is powered with the four cylinder in-line, inverted, 63 h.p. liquid cooled Funk engine. The ship is fabric covered, spars and ribs are of wood, and the fuselage is of welded steel tube construction. The Funk Model B has the following performance: high speed, 112 m.p.h.; cruising speed, 100 m.p.h.; climb, 750 ft. per min.; service ceiling, 16,000 ft.; fuel capacity, 16 gals.; range, 400 miles; weight empty, 870 lb.; gross, 1350 lb.

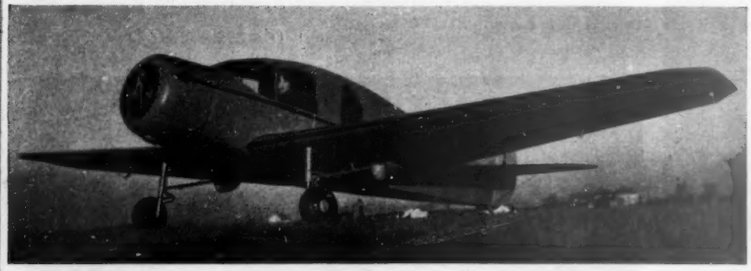


Applegate Amphibian

No A.T.C.

THE APPLEGATE AMPHIBIAN seats two, has a 75 h.p. Continental motor of pusher-type, mounted above the wing. Construction combines fabric-covered wings with hull of aluminum alloy, and landing gear of retractable type. High speed is 102 m.p.h.; cruising speed, 85 m.p.h. Service ceiling is 11,000 ft., normal range, 500 miles; climb, 450 ft. per min. Span is 34 ft. 6 in.; length, 25 ft.; height, 8 ft. Sells for $2,500 at factory.

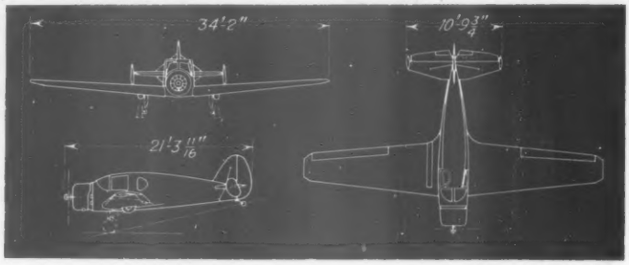


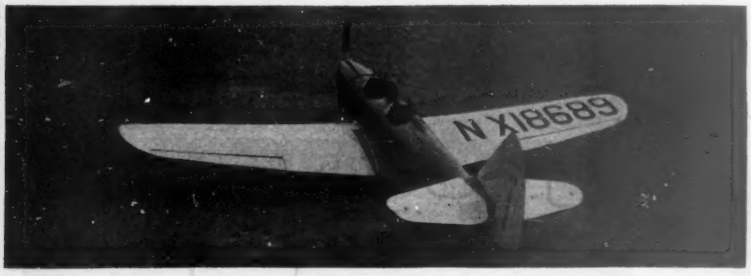


Bellanca Cruisair 14-9

No A.T.C.

THE BELLANCA CRUISAIR Model 14-9 is a 3-seat monoplane, mounting a 90 h.p. LeBlond Engine, with retractable landing gear. Two vertical fins are mounted at the ends of the stabilizer. Maximum speed is 133 m.p.h., cruising 120 m.p.h. Service ceiling is 14,000 ft. with a climb of 750 ft. per min., and range of 420 miles. Dimensions are: span, 34 ft. 2 in.; length, 21 ft. 3 in.; height, 6 ft. 3 in. Selling price is $3,795 flyaway at factory. Equipment items extra.

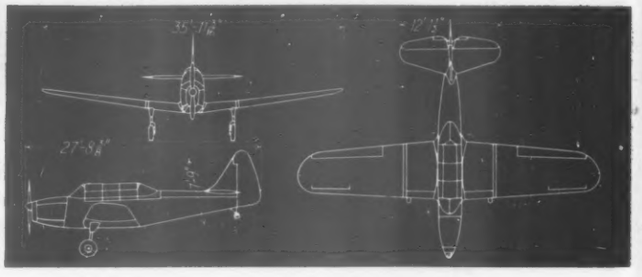


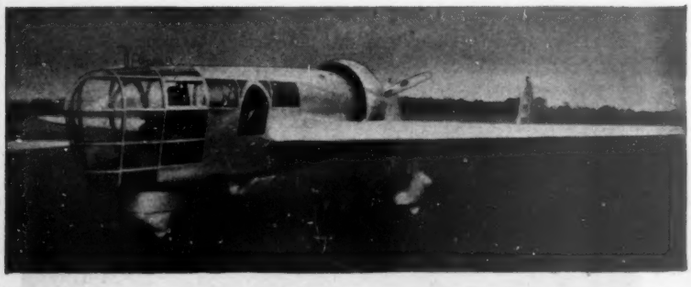


Fairchild M-62

No A.T.C.

THE FAIRCHILD M-62 is a primary trainer and also bears Air Corps designation PT-19. This two-place craft has a 175 h.p. Ranger motor, fixed landing gear, spars of solid spruce, ribs of aluminum alloy, plywood-covered wings and a welded steel and fabric hull. Top speed is 140 m.p.h., cruising speed 120 m.p.h. Normal range is 550 miles, service ceiling 16,000 ft. Climb at sea level is 835 ft. per min. Span, 36 ft.; length, 27 ft. 8 in.; height, 7 ft. 9 in.





Abrams Explorer

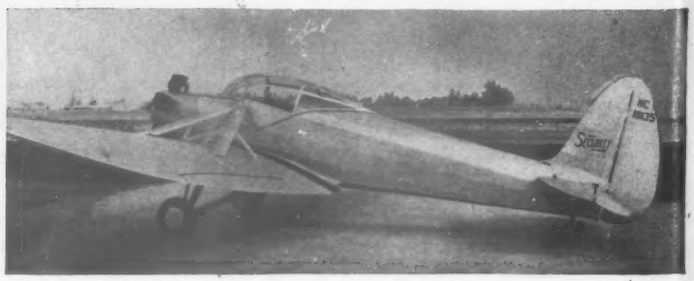
No A.T.C.

ABRAMS EXPLORER Model PC-4 has a Wright 420 h.p. engine. Range, 2150 mi.; climb, 1180 ft. per min.; service ceiling, 30,000 ft.; span, 36 ft. 6 in.

American Aircraft S-1B

No A.T.C.

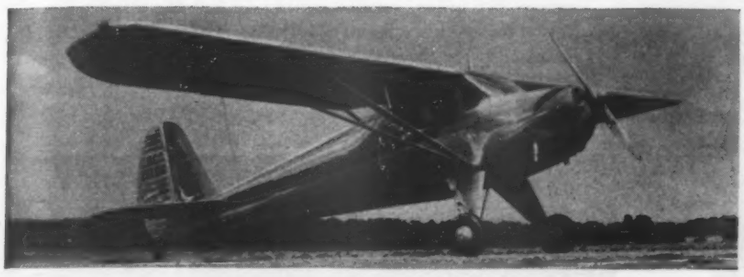
THE AMERICAN AIRCRAFT S-1B (Security Airster). Powered by a Security 125 h.p., the plane seats two, operates at 120 m.p.h. top speed, and 120 m.p.h. cruising.



Kellett KD-1

A.T.C. 712

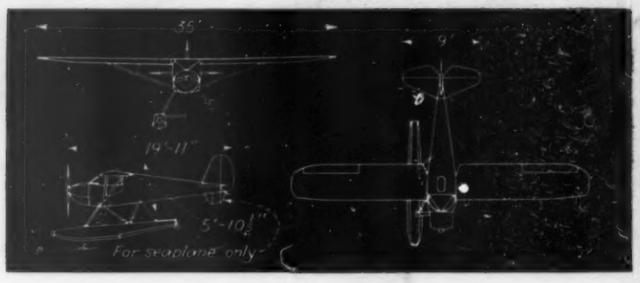
KELLETT offers a single seat model, KD-1B (three-view of which is shown), and a two-place model, KD-1, (a photograph of which is shown.) The KD-1B is familiar as the type used to shuttle the mail from the Philadelphia Post Office roof to Camden Airport. Both powered by Jacobs 225 h.p. Performances, KD-1B (KD-1): high speed, 127 (125) m.p.h.; cruising, 102 (100) m.p.h.; climb, 1060 (1160) ft. per min.; range, 208 (205) miles; weight empty, 1630 (1600) lb.; gross weight, 2250 (2245) lb.



Luscombe Model 8A

A.T.C. 694

LUSCOMBE'S Model 8 and Model 8A are powered by Continental, the former with 50 and the latter with 65 h.p. Model 8A is also available as a seaplane. Performance of Model 8A follows: top speed, 115 m.p.h.; cruising speed, 104 m.p.h.; climb, 900 ft. per min.; service ceiling, 15,000 ft.; range, 350 mi. Model 8A Seaplane: top speed, 102 m.p.h.; cruising, 95 m.p.h.; climb, 650 ft. per min.; service ceiling, 10,000 ft.; range, 350 miles.



Monocoupe 90-A

A.T.C. 306

THE MONOCOUPE 90-A is again offered at a price of $4175. Power is supplied by a 90 h.p. Lambert engine. Performance figures follow: High speed, 130 m.p.h.; cruising speed, 110 m.p.h.; stalling speed, 40 m.p.h.; climb, 900 ft. per min.; service ceiling, 15,000 ft.; range, 600 miles; weight empty, 937 lb.; gross weight, 1610 lb. Dimensions are: Span, 32 ft.; length, 20 ft. 6 in.; height, 6 ft. 11 in. Fuselage is welded steel tube, fabric covered.

Collier CA-1

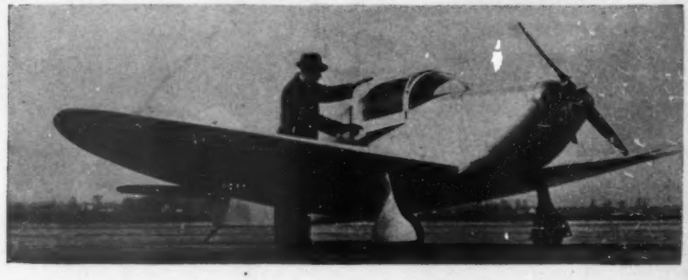
No A.T.C.

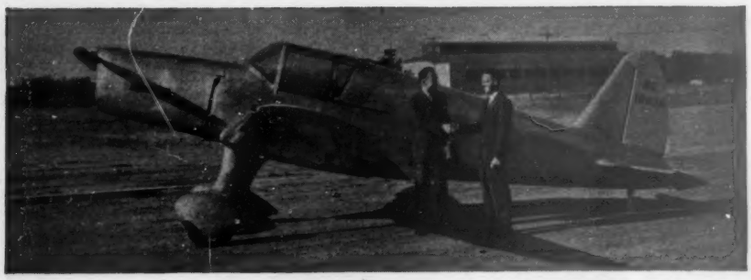
COLLIER AMBASSADOR, CA-1, two-place, is offered with a Menasco of 125 h.p. High speed, 135 m.p.h. at 1000 ft.; cruising, 125 m.p.h. at 1000 ft.; climb, 900 ft. per min.

Culver Dart L

No A.T.C.

CULVER DART Model L is two-place powered by 75 h.p. Continental. Retractable landing gear. Cruising speed, 125 m.p.h. Price will be approximately $2,200.

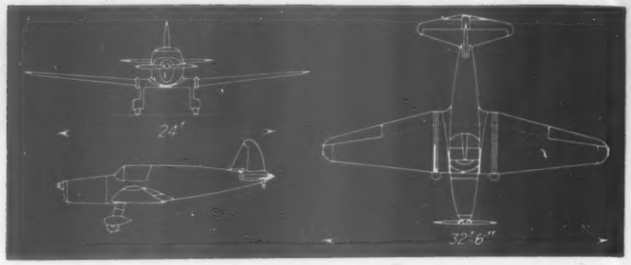


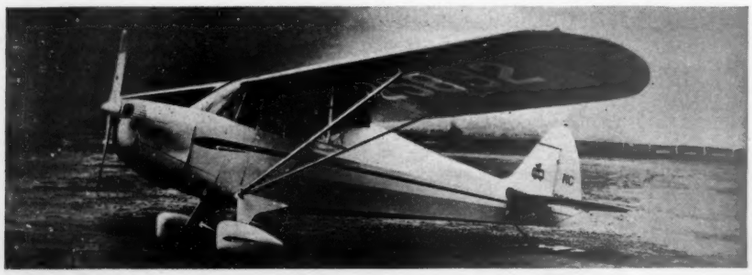


Phillips 1-B

A.T.C. 693

THE PHILLIPS 1-B 2-place plane has a 125 h.p. Menasco motor. It has a range of 720 miles, and has a service ceiling of 13,500 ft. Top speed 140 m.p.h., cruising 130 m.p.h. Climb is 710 feet per minute. Spars, ribs and wing-covering are of aluminum alloy—hull is of stiff skin. Span is 32 ft. 6 in.; length is 24 ft., height 7 ft. 8 in. It sells for $5,800 at factory.

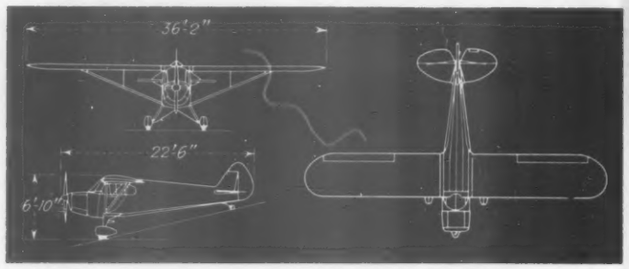


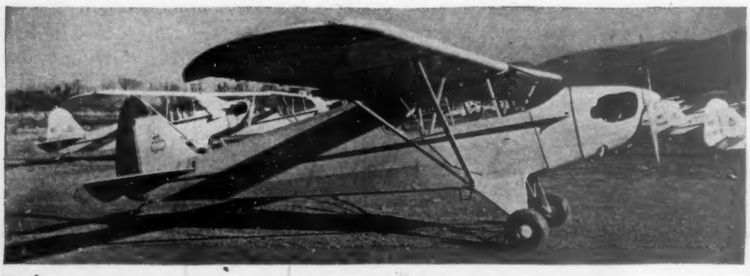


Piper Cub Coupe J-4

A.T.C. 703

THE PIPER CUB COUPE J-4, 2-place plane has a Lycoming 0-145 or series 7, 8 Continental A-65 both 65 h.p. motor, has a high speed of 100 m.p.h., cruising 87 m.p.h. Normal range 382 miles, service ceiling 12,000 ft., climbs 600–650 feet per minute. Span 36 ft. 2 in., length 22 ft. 6 in., height 6 ft. 10 in. Spars are of solid spruce, ribs of aluminum alloy. Hull is of welded steel and fabric. The plane sells for $1,910 to $1,995 at factory.

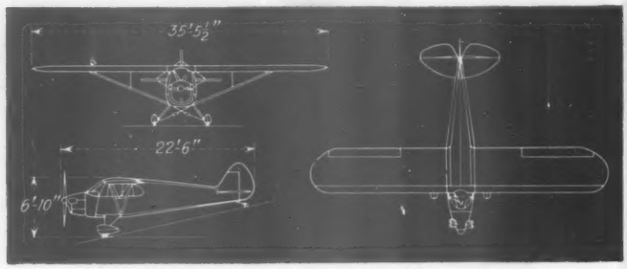


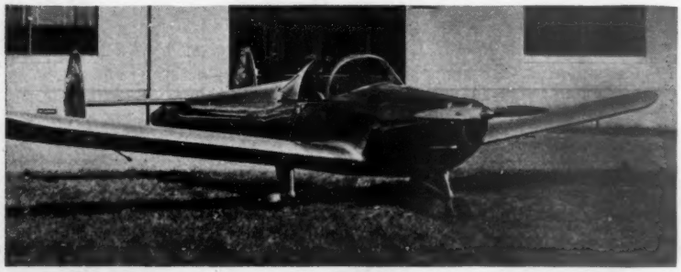


Piper Cub Cruiser J-5

No A.T.C.

THE PIPER J-5 3-place Cub Cruiser has a Continental A-75 h.p. motor. Service ceiling is 10,000 feet, normal range is 320 miles. It does a top speed of 100 m.p.h. and cruises at 87 m.p.h. Climb is 450 feet per minute. Spars of solid spruce, ribs of aluminum alloy, wings fabric-covered. Hull is of welded steel and fabric. Fixed landing gear, with tail wheel. Span 35 ft. 5½ in., length 22 ft. 6 in., height 6 ft. 10 in. Sells for $1,798 at factory.





Ercoupe 415

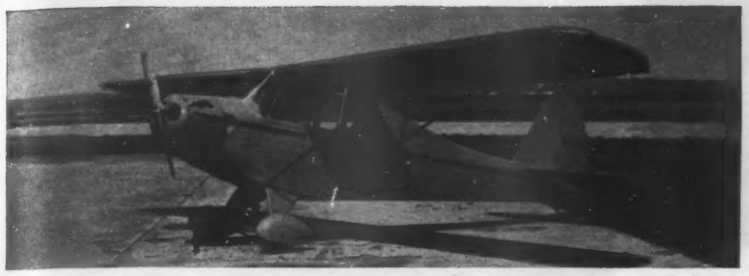
No A.T.C.

THE ENGINEERING & RESEARCH CORPORATION'S Ercoupe 415 is a two-place craft powered with a 60 h.p. Erco motor, designed for top speed of 106 m.p.h., cruising, 95 m.p.h.

Miller Z-1

No A.T.C.

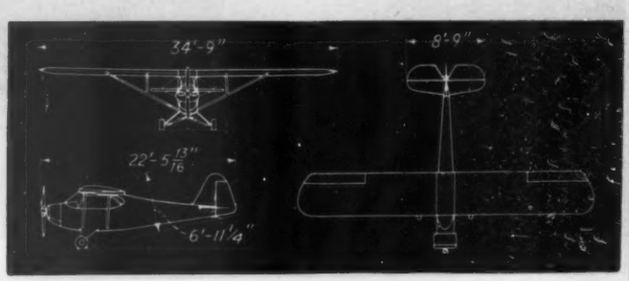
TWO-PLACE MILLER Z-1 performance: top speed, 125 m.p.h.; cruising, 110 m.p.h.; climb, 750 ft. per min.; service ceiling, 12,000 ft.; range, 555 mi.

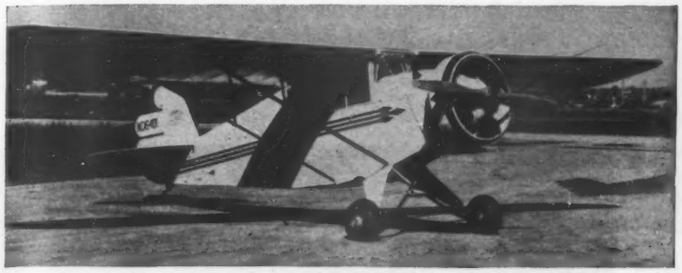


Porterfield 50

A.T.C. 690

THE PORTERFIELD 50 is a 2-place plane with a Continental 50 h.p. motor. It is scheduled to do 102 m.p.h high speed and 91 m.p.h. cruising. Normal range is 260 miles, service ceiling is 12,000 feet. Climb is 460 feet per minute. Spars and ribs are of spruce, wings are fabric-covered. Fuselage is of welded steel and fabric. Span is 34 ft. 9 in., length 22 ft., 5 11/16 in. The price of this plane at the factory is $1,495.





Porterfield 90

A.T.C. 611

THE PORTERFIELD 90 2-seater also has a 90 h.p. Warner motor, and will do 133 m.p.h. top speed, 120 m.p.h. at cruising. Service ceiling, 20,000 ft., normal range, 330 mi.

Porterfield 145

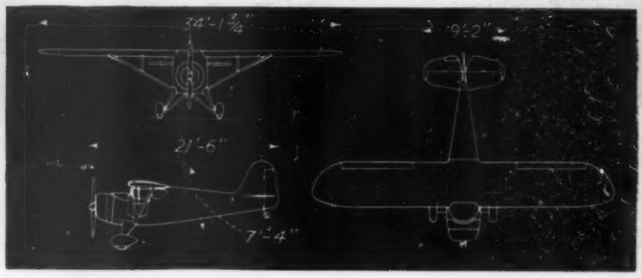
No A.T.C.

THE PORTERFIELD 145 is a 2-place craft powered by a 90 h.p. Warner motor. Top speed 125 m.p.h, cruising 113 m.p.h. Service ceiling 16,000 ft., normal range 400 mi.

Rearwin Cloudster, 8125

A.T.C. 711

THE REARWIN CLOUDSTER, Model 8125, is a two-place closed monoplane powered by a Ken Royce 120 h.p. engine. It sells for $4,295. The fuselage is of welded steel tube construction, fabric covered. Wings have wood spars and ribs and are also fabric covered. Performance figures follow: high speed, 145 m.p.h. at 800 ft.; cruising speed, 125 m.p.h. at 800 ft.; climb, 1000 ft. per min.; service ceiling, 17,000 ft.; range, 625 miles.



Rearwin 9000 KR

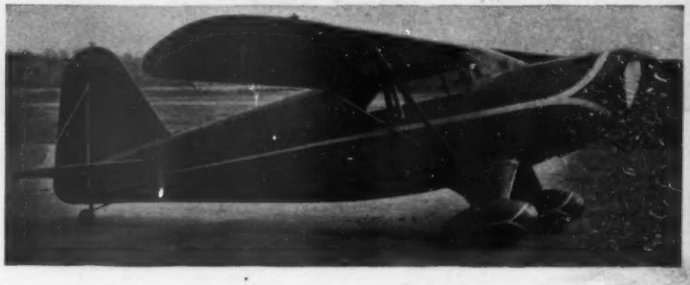
A.T.C. 591

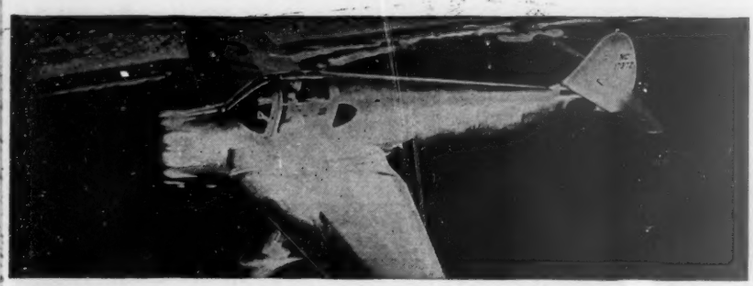
REARWIN SPORTSTER, 9000, 9000KR, is available as a seaplane. Warner, Ken Royce 90 h.p. engine. Top speed, 123–125 m.p.h. at 800 ft.; cruis., 110–112 m.p.h. at 800 ft.

Rearwin 6000M

A.T.C. 681

REARWIN SPEEDSTER, 6000M, $4,495, 2-place, Menasco 125 h.p. High speed, 150 m.p.h. at 800 ft.; cruising, 130 m.p.h at 800 ft.; climb, 1300 ft. per min.; range, 575 miles.

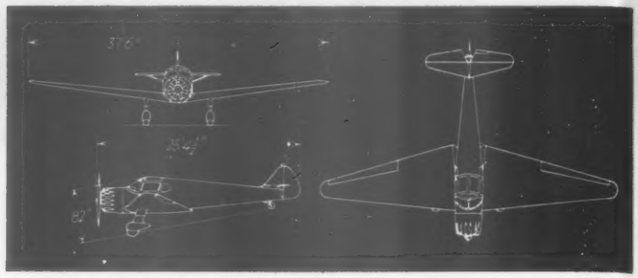




Ryan Model S-C

A.T.C. 658

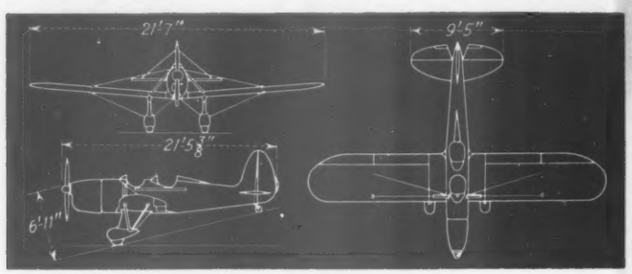
THE RYAN S-C is a three-place closed low-wing monoplane. Fuselage is of all-metal construction. Wings are fabric covered with metal spars and ribs. Power is by a 145 h.p. Warner engine. Top speed at sea level is 150 m.p.h.; cruising speed is 135 m.p.h. at 8500 ft.; climb, 900 ft. per min.; service ceiling, 17,200 ft.; range, 525 miles; fuel capacity, 37 gals.; stalling speed, 45 m.p.h.; weight empty, 1345 lb.; gross weight, 2150 lb.

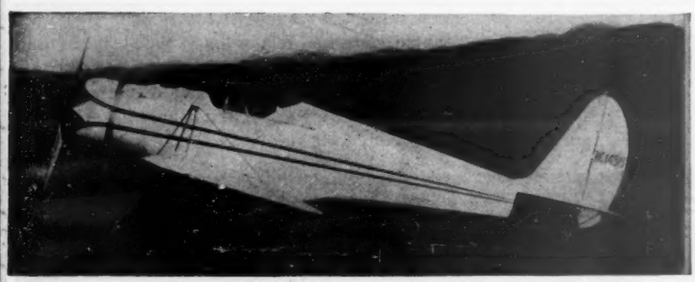


Ryan Model ST-A

A.T.C. 571

THE RYAN ST-A, two-place, low-wing Monoplane is offered with the Menasco 125 h.p. engine. It is also available as the ST-A Special with a Menasco having 150 h.p. at 3000 ft. Performances follow for ST-A and (ST-A Special): high speed, 126 m.p.h. (142 m.p.h. at 3000 ft.); cruising speed, 115 at 3000 ft. (128 at 3000 ft.); climb, 800 ft. per min. (975 ft. per min.); service ceiling, 16,000 ft. (18,600 ft.); stalling speed, 42 m.p.h. (both); range, 366 miles (326).





Pasped Skylark W-1

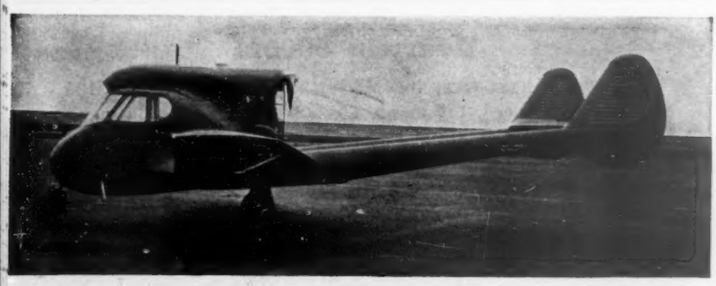
No A.T.C.

THE PASPED SKYLARK W-I is a 2 place craft with a 125 h.p. Warner motor. Its range is 545 miles, top speed 139 m.p.h., cruising 117 m.p.h., service ceiling 19,000 ft.

Phillips CT-1

No A.T.C.

THE PHILLIPS CT-1 is a two-place biplane. Its 120 h.p. Phillips motor is capable of a high speed of 127 m.p.h., cruising 110 m.p.h. Service ceiling is 18,000 ft.



Stearman-Hammond Y-1S

A.T.C. 644

THE STEARMAN-HAMMOND Y-1S is 2-place, powered by Menasco 150 h.p. Sells for $7,150. Top speed, 125 m.p.h. at 3000 ft.; cruising, 113 m.p.h. at 3000 ft.

White PT-7

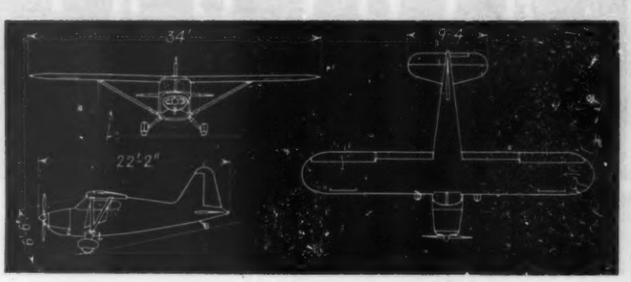
No A.T.C.

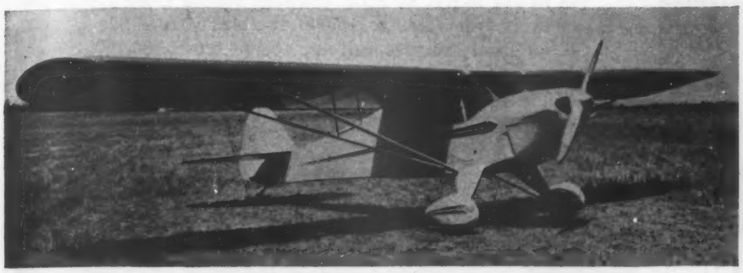
WHITE AIRCRAFT'S PT-7 is a 2-place open biplane with a 165 h.p. Warner engine. Top speed, 115 m.p.h.; cruising, 95 m.p.h.; climb, 1000; gross weight, 2243 lb.

Stinson 105

No A.T.C.

STINSON'S new three-place Model 105 is equipped with the Continental 75 h.p. or 80 h.p. (1940 model) engines. Performances follow, 75 h.p. (80 h.p.): cruising speed, 107.5 m.p.h. at 4600 ft. (111 m.p.h. at 4800 ft.); climb, 430 ft. per min. (485 ft. per min.); service ceiling, 9,100 ft. (12,100 ft.); range, 405 mi. (405 mi.); fuel capacity, 20 gals. (20 gals.); weight empty, 900 lb. (900 lb.); gross weight, 1580 lb. (1580 lb.). Stalling speed is 43 m.p.h. in both cases.

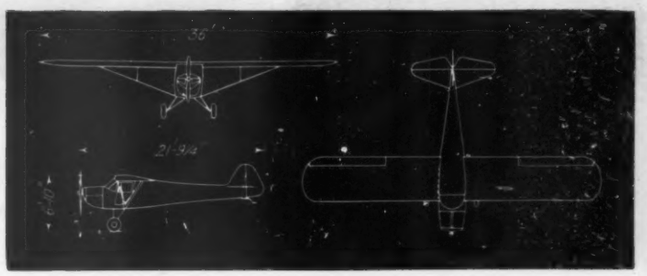




Taylorcraft BC-65

A.T.C. 700

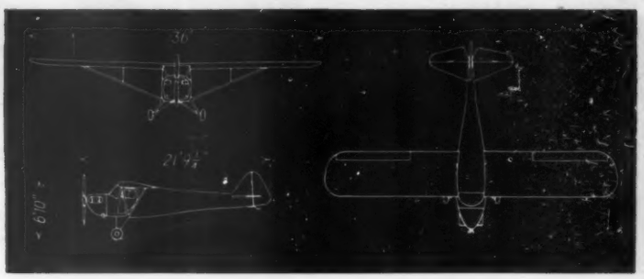
THE TAYLORCRAFT two-place Model BL-65, BC-65 is powered by the 65 h.p. Lycoming or Continental engine. It is priced at $1,775 to $1,835 and is also available as a seaplane. Top speed is 105 m.p.h.; cruising speed, 95 m.p.h.; stalling speed, 38 m.p.h.; climb, 640 ft. per min.; service ceiling, 15,000 ft.; fuel capacity, 12 gals.; fuel consumption at cruising speed, 3.75 gals. per hr.; range, 250 miles; weight empty, 660 lb.; gross weight, 1150 lb.



Taylorcraft BL-T

A.T.C. 700

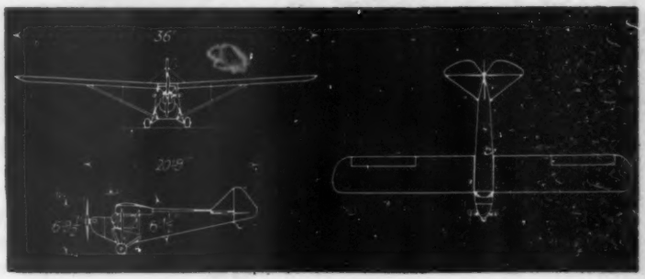
TAYLORCRAFT'S Model BL-T Trainer is equipped with either a Lycoming, Franklin, Continental, 50 h.p. engine. It is two-place, available as a seaplane. Construction is conventional welded steel tube fuselage. Wings have wood spars, metal ribs, and are fabric covered. High speed, 97 m.p.h.; cruising speed, 88 m.p.h.; stalling speed, 38 m.p.h.; climb, 450 ft. per min.; service ceiling, 13,000 ft.; range, 210 miles; weight empty, 632 lb.; gross weight, 1150 lb.



Welch OW

A.T.C. 636, 637

THE WELCH AIRCRAFT INDUSTRIES, Model OW, is a two place closed monoplane available with a choice of the following engines: Continental 40 h.p.; Aeronca 40 h.p.; Welch, 0-2, 45 h.p.; and Franklin 50 h.p. Performances fall between the following limits depending on the power: high speed, 93–100 m.p.h.; cruising speed, 85–90 m.p.h.; stalling speed, 29–32 m.p.h.; climb, 460–550 ft. per min.; service ceiling, 12,000-14,000 ft.; range, 240-250 mi.



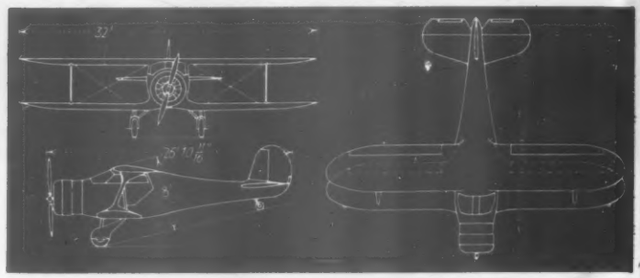
AIRCRAFT of 4 and 5 SEATS

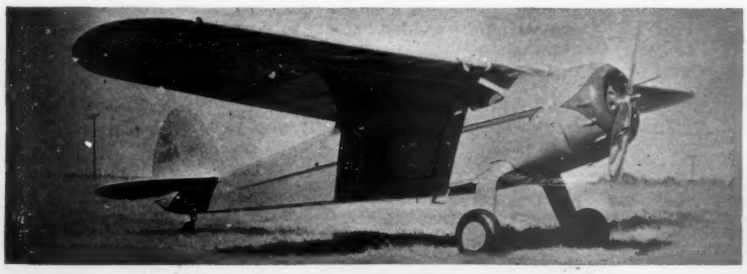
For complete specifications see page 71

Beech D-17A

A.T.C. 713

BEECH'S well known five-place biplane appears in five models powered by Jacobs, Pratt & Whitney, or Wright engines ranging from 285 to 450 h.p. Performance varies, depending on the power as follows: high speeds from 178 to 211 m.p.h. at S.L.; cruising speeds from 177 to 204 m.p.h. at from 7200 to 10,000 ft.; climb from 900 to 1600 ft. per min.; service ceiling, 15,500 to 24,000 ft.; range, 725 to 820 mi.; gross weights from 3350 to 4200 lb.

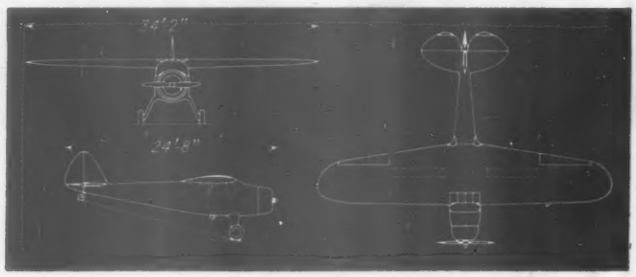




Cessna C-145

A.T.C. 701

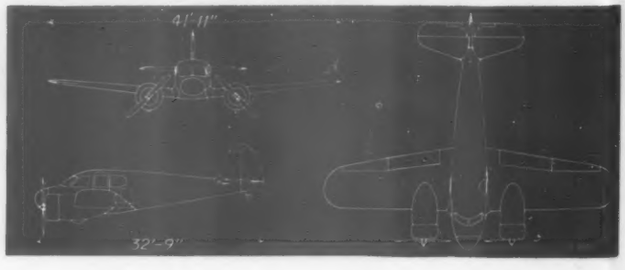
CESSNA'S four-place monoplane, C-145, is powered by a Warner 145 h.p. engine. Cessna also has in production a similar ship powered with the Warner 165 h.p. engine and is the Model C-165. Performance of Model C-145: top speed, 162 m.p.h.; cruising, 151 m.p.h.; climb, 1000 ft. per min.; service ceiling, 18,000 ft.; range, 525 mi.; weight empty, 1380 lb.; gross weight, 2350 lb. C-165: top speed, 165 m.p.h.; cruising, 157 m.p.h.; climb, 1125 ft. per min.; weight empty, 1400 lb.; gross, 2350 lb.



Cessna T-50

No A.T.C.

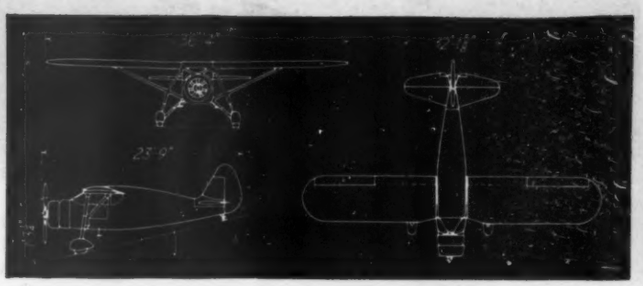
CESSNA'S newest is the twin-engine Model T-50. It is a five-place ship, is powered by two 225 h.p. Jacobs engines and has a retractable landing gear. Fuselage is of welded steel tube construction, fabric covered. The ship has a high speed of 195 m.p.h. at S.L.; cruises at 191 m.p.h. at 7500 ft.; climbs, 1525 ft. per min.; has a service ceiling of 22,000 ft.; a range of 750 miles; weight empty, 3500 lb.; gross weight, 5000 lb.



Fairchild F-24

A.T.C. 707

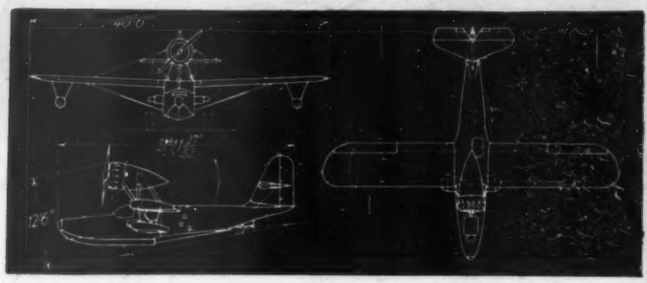
THE FAIRCHILD four-place F-24 W-40 is available as a landplane or seaplane powered by the Warner 145 h.p. engine. The price is $5,995. Performance is as follows: high speed, 135 m.p.h.; cruising, 122 m.p.h. at 7000 ft.; climb, 720 ft. per min.; service ceiling, 15,700 ft.; range, 720 miles; fuel capacity, 60 gallons, weight empty, 1482 lb.; gross weight, 2550 lb.; span, 36 ft. 4 in.; length, 23 ft. 9 in.



Fleetwings, Inc.

A.T.C. 680

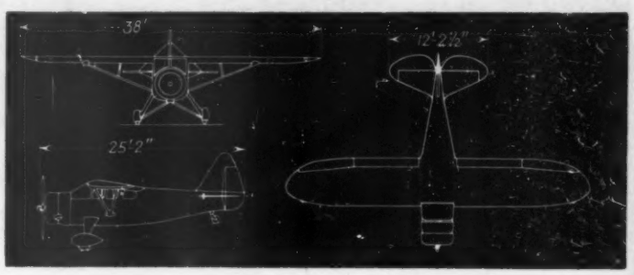
FLEETWINGS, INC., again offers its amphibion with a 300 h.p. Jacobs engine. Except for the wing covering which is fabric, the ship is built entirely of welded stainless steel. The following performance figures are given: High speed, 150 m.p.h.; cruising speed, 135 m.p.h.; service ceiling, 14,000 ft.; range, 516 mi.; weight empty, 2454 lb.; gross weight, 3750 lb. This model is also available with two position propeller giving increased performance.



Howard DGA-15

No A.T.C.

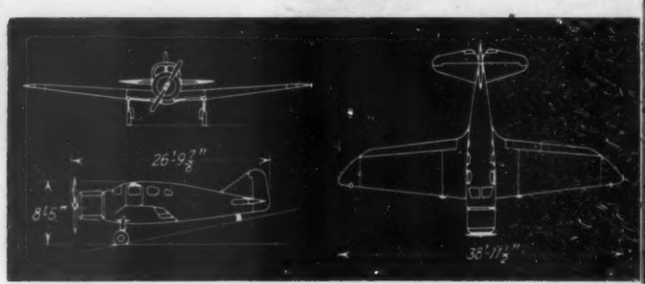
THE HOWARD five-place DGA-15 is designed along typical Howard lines and is equipped with a Pratt & Whitney Wasp, Jr., of 400 h.p. at 5000 feet. It is capable of a top speed at sea level of 186 m.p.h.; cruises at 191 m.p.h. at 9600 ft.; climbs 1560 ft. per min.; has a service ceiling of 21,500 ft.; a range of 965 miles; a weight empty of 2725 lb.; gross weight, 4250 lb. Model U-15 is available on order, and suitable as photographic, ambulance, or cargo plane.

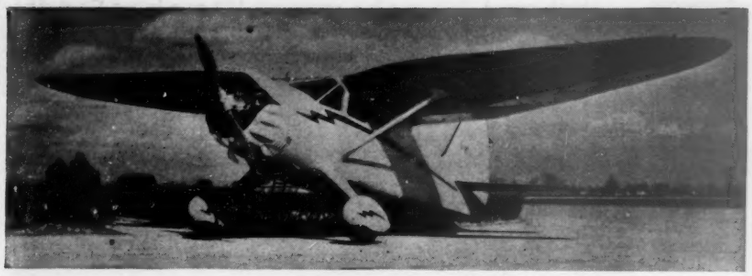


Spartan Executive 7W

A.T.C. 628

THE SPARTAN AIRCRAFT COMPANY'S all-metal Executive 7W is equipped with a retracting landing gear and is powered by a Pratt & Whitney Wasp, Jr., of 450 h.p. The high speed of this ship is 212 m.p.h. at 5000 ft.; cruising speed is 205 m.p.h. at 9600 ft.; climb, 1530 ft. per min.; the service ceiling is 22,000 ft.; range is 900 miles; the weight empty is 2992 lb.; while the gross weight is 4400 lb. Fuel capacity is 112 gallons.

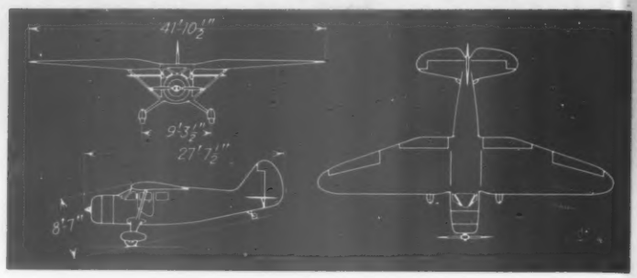




Stinson SR-10

A.T.C. 676, 679, 685

THE POPULAR 4-5 place Stinson Reliant is offered in nine models, five of which are available also as seaplanes. These models are powered with Lycoming, Pratt & Whitney, or Wright engines of from 225 to 420 h.p. with the following performance range: cruising speed, 147 m.p.h. at 4000 ft. to 175 m.p.h. at 9600 ft.; climb, 855 ft per min. to 1450 ft. per min.; service ceiling, 13,800 ft. to 21,000 ft.; weight empty, 2515-3045 lb.; gross, 3875-4650 lb.



Waco E

No A.T.C.

WACO'S Model E comes with Jacobs, Pratt & Whitney, or Wright engines of 300 to 420 h.p. Cowl is integral part of ship. Has controlled cooling.

Waco N

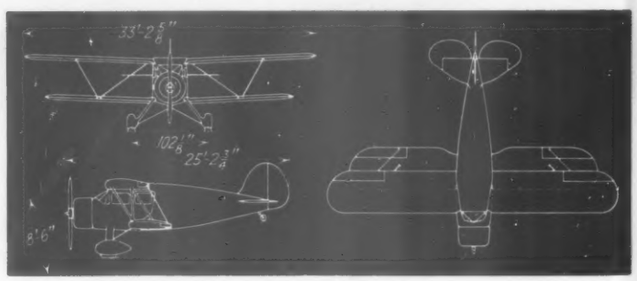
A.T.C. 677

WACO Model N has tricycle landing gear, 300 h.p. Jacobs engine. Price is $12,800. Five-place, cruises, 151 m.p.h at 8500 ft., range, 625 mi.

Waco S

A.T.C. 626, 648

THE WACO Model S is supplied with Jacobs or Continental engines of from 225 to 285 h.p. It is priced from $7,070 to $7,890. Performances fall between the following limits: high speed, 144 to 152 m.p.h.; cruising, 135 to 144 m.p.h. at 6000 to 10,000 ft.; climb, 750 to 850 ft. per min.; service ceiling, 12,500 to 14,000 ft.; range, 492 to 518 miles; fuel capacity 70 gals.; weight empty, 1945 to 1981 lb.; gross weight, (in all cases) 3250 lb.



Fairchild F-24, R-40

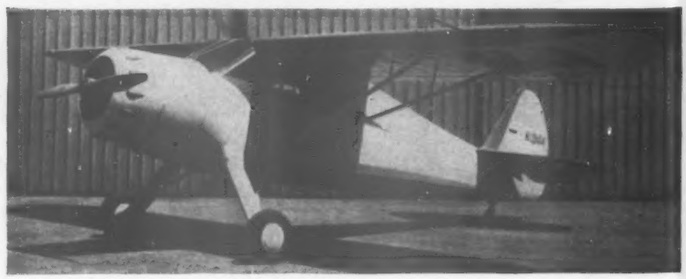
No A.T.C.

FAIRCHILD 4-place F-24 R-40 with Ranger 175 h.p. engine, available either as landplane or seaplane. Price $7,230. Range, 500 miles on 40 gal.

Ong M-32

No A.T.C.

THE ONG four-place M-32 is powered by Warner and Menasco engines from 145 to 165 h.p. Price with Warner 145 h.p. $6,485. Span 36 ft. 6 in.

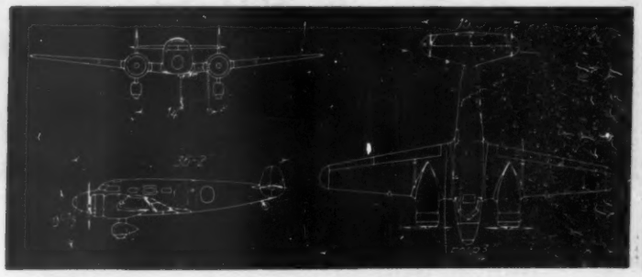


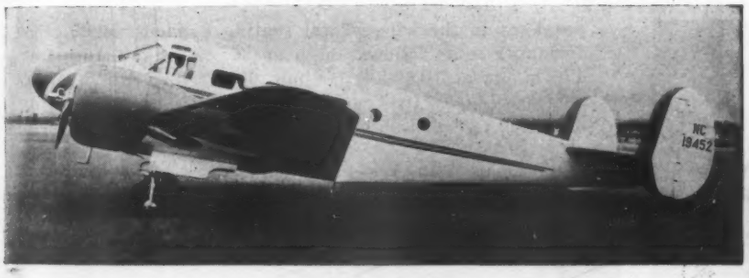
AIRCRAFT of 6 or more SEATS

For complete specifications see page 71

Barkley-Grow T8P-1 A.T.C. 662

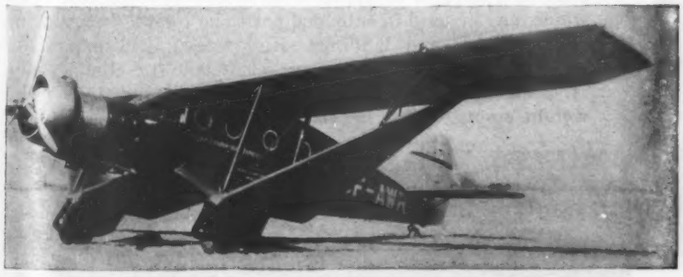
THE BARKLEY-GROW T8P-1 is a ten-place, low wing transport powered by two Pratt & Whitneys giving a total of 800 h.p. This ship is available also on floats or skis. Fuel capacity is 160 gallons which gives a range of 750 miles. Other performance figures are as follows: high speed, 205 m.p.h. at 5000 ft.; cruising speed, 192 m.p.h. at 9600 ft.; stalling speed, 63 m.p.h.; climb, 1300 ft. per min.; service ceiling, 19,000 ft.; weight empty, 5649 lb.; gross, 8750 lb.





Beech 18-S A.T.C. 710

THE twin-engine Beech Model 18 is offered in one 6-8 place model, the 18S, and two 8-9 place models, the 18A and 18D. They are powered by Pratt & Whitney, Wright, and Jacobs respectively. Total power ranges from 640 in the 18A to 900 h.p. in the 18S. Performances are as follows: top speed, 206-230 at S.L.; cruising, 200-220 at 10,000-12,000 ft.; climb, 1100-1850 ft. per min.; service ceiling, 17,200-27,000 ft.; and gross weights from 7200 to 7500 lb.

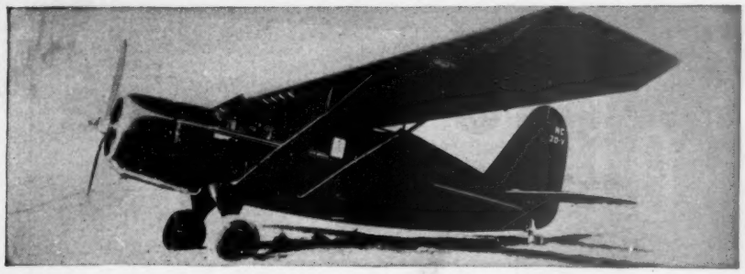


Bellanca Aircruiser Cargo A.T.C. 563

BELLANCA'S AIRCRUISER CARGO is fifteen place single engine ship with 715 h.p. Wright Cyclone. Cruising, 155 m.p.h. at 12,000 ft.; wgt. empty, 6115 lb.; gross, 11,400 lb.

Air Transport T-6 A.T.C. 223

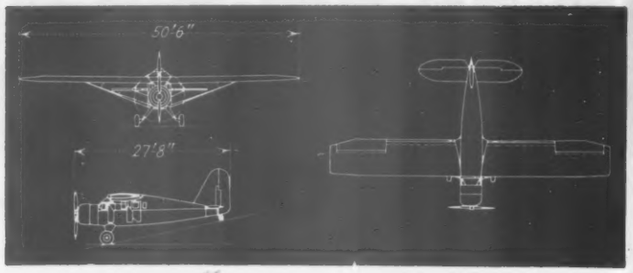
AIR TRANSPORT Mfg. Company's T-6 is six place with three 100 h.p. Kinners. Cruising speed, 125 m.p.h. at 1000 ft.; climb, 1100 ft. per min.; range, 450 miles.



Bellanca Pacemaker

A.T.C. 578

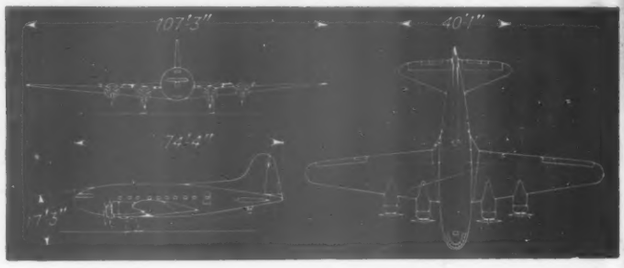
PACEMAKER BY BELLANCA is a six-place monoplane powered by a 420 h.p. Wright Whirlwind. This is one of the most familiar of the Bellanca models and has long since proved its efficiency by many endurance and long distance flights. Performance: high speed, 160 m.p.h.; cruising, 145 m.p.h.; climb, 700 ft. per min.; service ceiling, 16,000 ft.; range, 860 miles; weight empty, 3250 lb.; gross weight, 5600 lb.

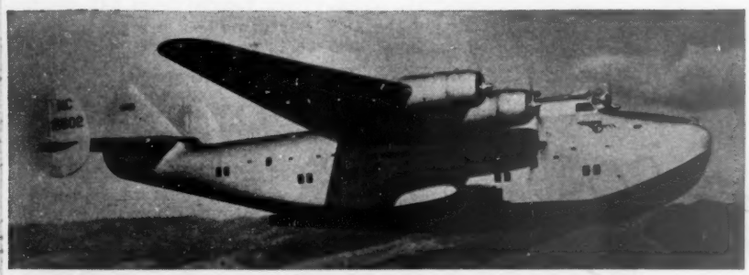


Boeing 307

No A.T.C.

BOEING'S Model 307, better known as the Stratoliner, will bring to the airlines a 38 seat, four engine transport with a supercharged cabin for high altitude flying. Below 12,000 foot pressure will be maintained in the cabin at an altitude of 20,000 feet. Total power will be 4400 h.p. supplied by Wright Cyclones. High speed, 240 m.p.h. at 6000 ft.; cruising, 215 m.p.h. at 10,000 ft.; climb, 1250 ft. per min.; weight empty, 29,000 lb.; gross weight, 45,000 lb.

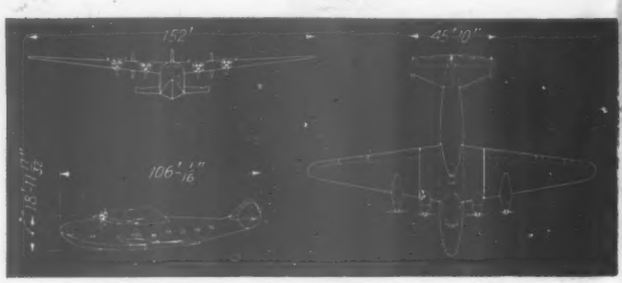


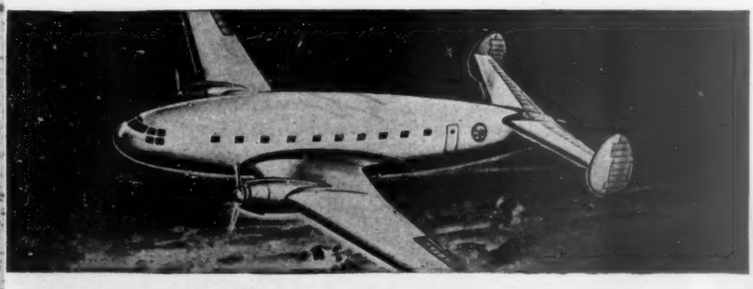


Boeing 314

A.T.C. 704

THE 314 IS BOEING'S ocean transport. Power of 6000 h.p. is supplied by four Wright Double-Row Cyclones. Access to the four engines is possible during flight by means of passages in the wing. Total seating capacity is 89. Performance is as follows: high speed, 190 m.p.h.; cruising, 175 m.p.h. at 10,000 ft.; climb, 650 ft. per min.; service ceiling, 14,000 ft.; range, 3100 miles; weight empty, 48,545 lb.; gross weight, 82,500 lb.

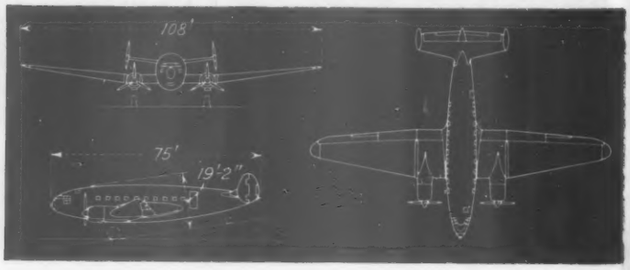


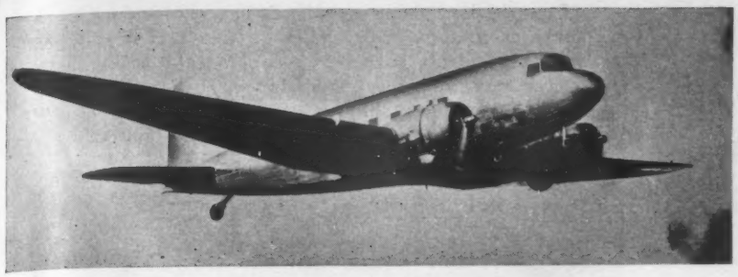


Curtiss-Wright (St. Louis) Transport

No A.T.C.

THE CURTISS-WRIGHT transport is a 36/40-place two engine ship with a supercharged passenger cabin. Double-Row Cyclones supply the necessary power. Wings are flush riveted and equipped with a new type slotted flap which may be used in extended positions for take-off, single engine flight, and landings. High speed, 243 m.p.h. at 13,000 ft.; cruising, 210 m.p.h. at 10,000 ft.; climb, 1440 ft. per min.; service ceiling, 26,900 ft.; range, 1500 mi.; weight empty, 24,750 lb.; gross weight, 38,000 lb.

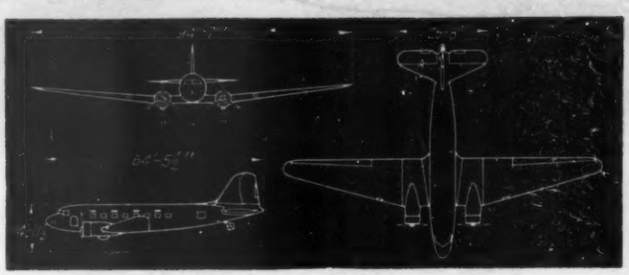


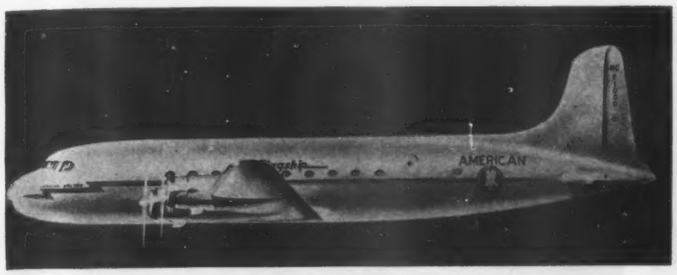


Douglas DC-3

A.T.C. 618

THE DOUGLAS DC-3 has become a familiar sight on practically all the large airports of the world. It seats 21 and can be had with either Pratt & Whitney or Wright engines supplying a total of 2400 h.p. High speed, 219 m.p.h.; cruising speed, 196 m.p.h.; stalling speed, 67 m.p.h.; climb, 1200 ft. per min.; service ceiling, 22,750 ft.; total fuel capacity of 822 gals. gives a range of 2125 miles; weight empty, 16,398 lb.; gross weight, 24,400 lb.; span 95 ft.; height, 16 ft. 11 in.





Douglas DC-4

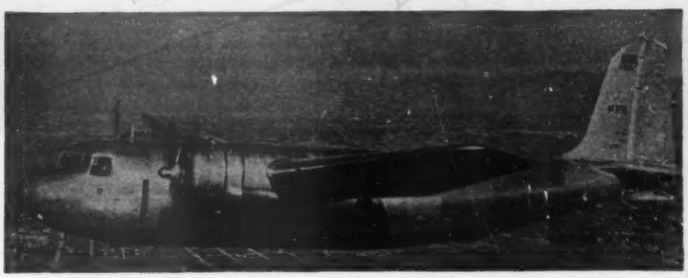
No A.T.C.

DOUGLAS DC-4 newest version seats 40, has tricycle landing gear, either Pratt & Whitney or Wright engines. Total 4800 h.p. 47,000 lb. gross.

Douglas DC-5

No A.T.C.

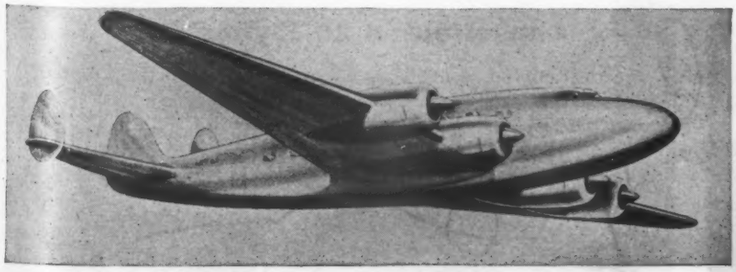
DOUGLAS DC-5 high wing monoplane, tricycle gear, 16 seats, two-engines, Pratt & Whitney or Wright. Total 2200 h.p. Wt. empty, 13,674. Gross, 20,000 lb.



Grumman G-21A

A.T.C. 654

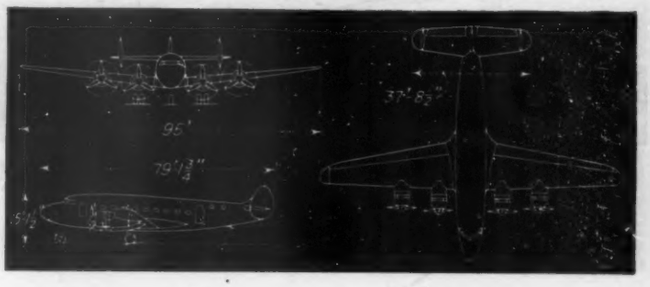
GRUMMAN again presents their versatile 8-place amphibion, G-21A. This ship is suitable to certain air line work as well as being an ideal airplane for the private owner. Power is obtained from two Pratt & Whitney Wasp, Jr., engines supplying a total of 800 h.p. at 5000 ft. Performance: high speed, 201 m.p.h. at 5000 ft.; climb, 1300 ft. per min.; service ceiling, 22,000 ft.; and range is 1000 miles. Weight empty is 5475 lb.; gross weight is 8000 lb.

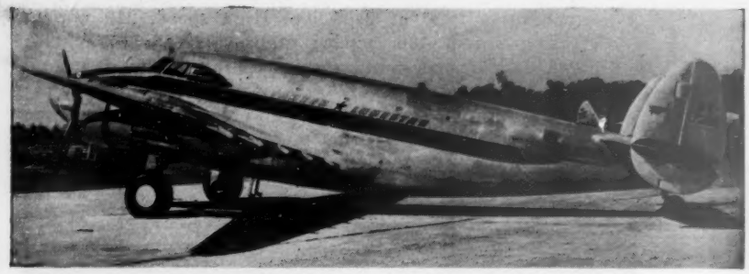


Lockheed 44

No A.T.C.

LOCKHEED'S offering in the line of four engine transports is the Model 44. It is supplied with a choice of four engines, either by Wright or Pratt & Whitney. Total powers are from 4500 h.p. to 7500 h.p. Performances vary between the following limits, depending on power: high speed, 255-294 m.p.h.; cruising 232-262 m.p.h.; climb, 1130-1635 ft. per min.; range, 1510-1600 miles; weight empty, 24,137-25,813 lb.; gross weight, 37,500-40,000 lb.

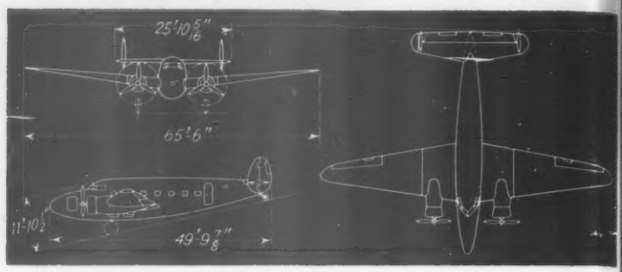


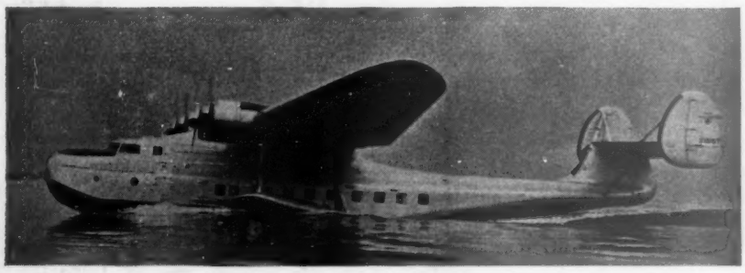


Lockheed Lodestar (18)

No A.T.C.

THE MODEL 18 Lockheed Lodestar is a two-engine transport accommodating 14 passengers and a crew of three. Among the objectives of the design are; low control forces, high cruising speeds at low engine powers, and large cabin area. It is available with a choice of power plants by Pratt & Whitney and Wright giving a total power output range of from 1500-2200 h.p. Performances range as follows: high speed, 240 m.p.h. at 8000 ft.; cruising, 220 m.p.h. at 12,000 ft.; range, 1200-1515 miles.

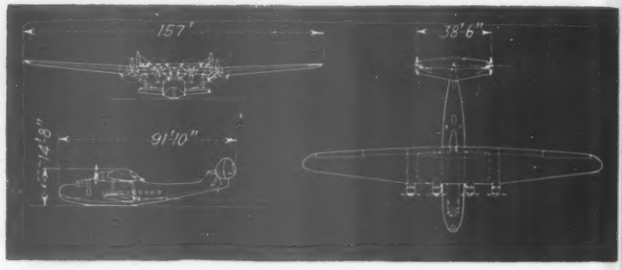


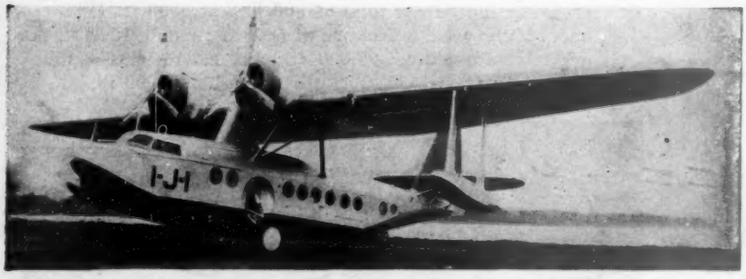


Martin 156

A.T.C. 697

THE MARTIN 156C and 157F are a four engine, 53-57 seat, ocean transport. They are a larger edition of the familiar Martin 130 (China Clipper). Its four Wright Cyclones or P. & W. Hornets give it a total of 3400-4200 h.p. at 5800-6500 ft. It has a wing span of 157 ft. with range of 3800-4460 mi.; fuel, 5800-6500 gals. Top speed is 182-203 m.p.h. at 5800-6500 ft.; cruising speed is 140-145 m.p.h. at 10,000 ft.; weight empty is 31,292-33,356 lb.; while the gross weight is 63,000-70,000 lb.

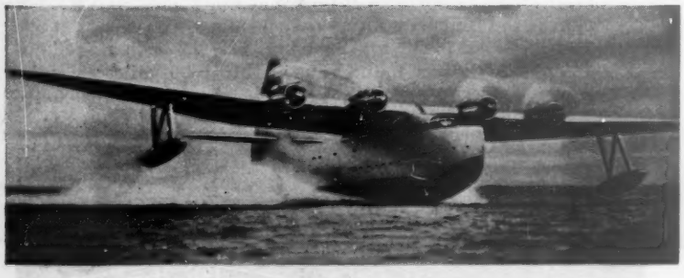




Vought-Sikorsky S-43

A.T.C. 593

THE S-43 BY VOUGHT-SIKORSKY is an 18-place amphibian powered by two Pratt & Whitney Hornets which supply a total of 1500 h.p. at 7000 feet altitude. The performance figures for this airplane follow: high speed is 190 m.p.h. at 7000 ft.; cruising speed is 166 m.p.h. at 7000 ft.; climb, 1000 ft. per min.; range with normal fuel capacity of 400 gals. is 775 mi.; stalling speed, 65 m.p.h.; weight empty, 12,900 lb.; gross weight, 19,500 lb.



Vought-Sikorsky S-44

No A.T.C.

VOUGHT-SIKORSKY S-44 is a 32-seat, 4-engine flying boat with P. & W.'s giving 4200 h.p. at 7500 ft. Cruising speed, 175 m.p.h. at 7500; gross weight, 57,500 lb.

Consolidated 28 Flying Boat

No A.T.C.

CONSOLIDATED Model 28 is 20 passenger flying boat. Two P. & W. Twin Wasps, total 2100 h.p. Cruising speed, 179 m.p.h. at 7800 ft.; gross weight, 27,000 lb.

MILITARY AIRCRAFT

DOMESTIC and EXPORT

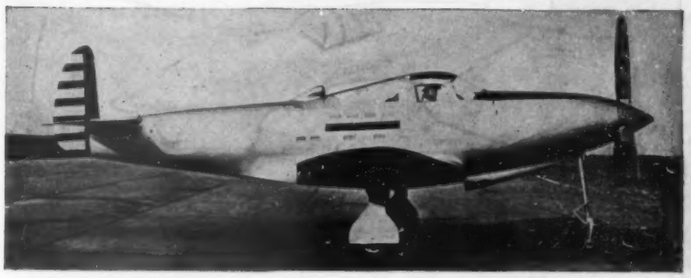
For complete specifications see page 73

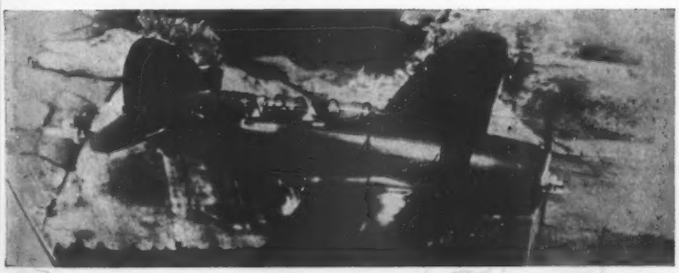
Bell Airacuda YFM-1

BELL'S Airacuda YFM-1 comes in a new design as a patrol fighter or bomber convoy, with large range, fire, power, vision maneuverability. Equipped for high flying.

Bell Interceptor-Pursuit P-39

BELL'S radical new Model P-39 interceptor-pursuit features retractable tricycle gear and a 12-cylinder, 1,000 hp Allison in rear of cabin. Equipped for high flying.



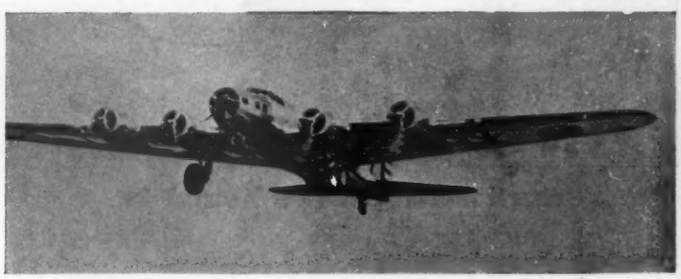


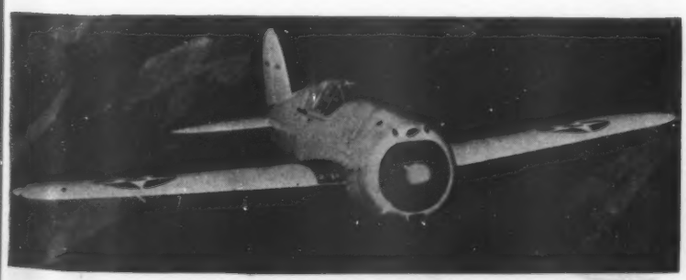
Bellanca 28

THE BELLANCA Model 28 2-place ship has a Pratt & Whitney Twin Wasp engine, 950 hp. High speed 280 mph, normal range 800 mi. Climb 2,800 ft. pr. min.

Boeing B-299Y

BOEING Model B-299Y, the Flying Fortress, with 4,000 hp from four Wright Cyclones, has top speed of 268 mph at 14,000 ft.; cruising, 220 mph. at 10,000 ft.





Brewster 239

BREWSTER Model 239 is a single-seater with a Wright Cyclone 750 hp engine. It has retractable landing gear. Performance figures are not released.

Consolidated 28

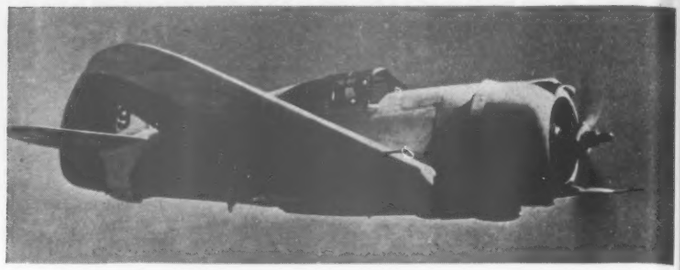
CONSOLIDATED'S Model 28 twin-engined flying boat features a wide scope of possible operations, 9-man crew space, machine gun and bombing equipment.

Consolidated 28 Amphibian

CONSOLIDATED'S Model 28 Amphibion has two P & W Twin Wasps delivering 2,100 hp total at 7,800 ft. High speed, 199 mph. at 7,800 ft.; cruising, 179 mph. at 7,800 ft.

Curtiss-Wright (Buffalo) P-36-A

THE CURTISS Model P-36-A follows the familiar Curtiss pursuit ship design, with retractable gear. Because of its restricted status, no specifications are available.

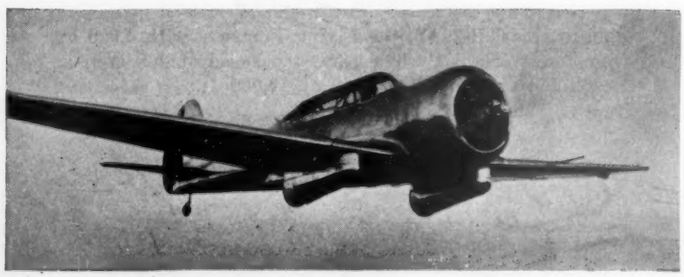


Curtiss-Wright (Buffalo) P-40

THE CURTISS-WRIGHT Model P-40 is a one-place pursuit ship with retractable gear, air-cooled motor, closed nose. Its restricted status makes specifications unavailable.

Curtiss-Wright (Buffalo) XS03C-1

THE CURTISS Model XS03C-1 scout observation plane is for battleships and cruisers. With wheels and floats interchangeable, it is designed especially for the Navy.

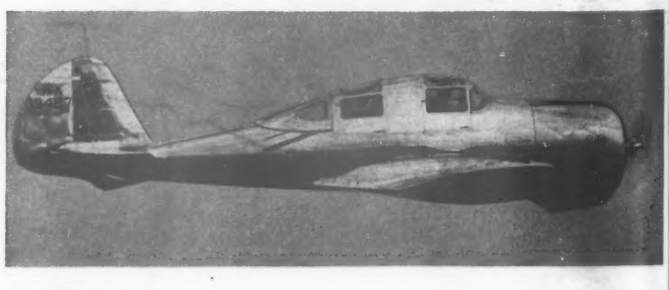


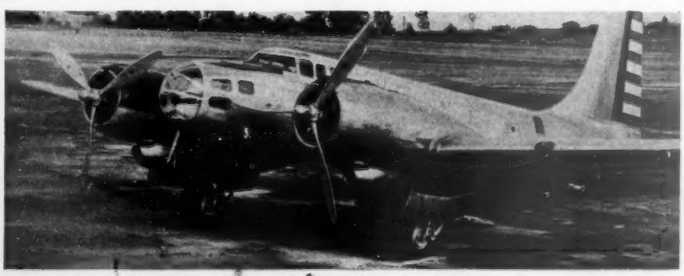
Curtiss-Wright (St. Louis) 22

THE CURTISS Falcon 22 basic combat and all-purpose trainer is of the all metal type with retractable gear. 420 hp. Wright engine.

Curtiss-Wright (St. Louis) 23

THE CURTISS Model 23 is an advance issue of model 22, powered with a Pratt & Whitney. This new pursuit ship is all-metal, retractable gear and tail-wheel.





Douglas B-23

NEWEST DOUGLAS bomber is the Model B-23. This ship has improved performance and is expected to have a greater range and maneuverability than others of its type.

Lockheed 322-61

LOCKHEED'S Model 322-61 pursuit ship powered by two 1,090 hp Allison motors. Top speed 404 mph, cruising 350 mph. Service ceiling 28,000 ft., range 600 mi.

Grumman G-36

THE GRUMMAN G-36 is a single-place fighter, powered by a Pratt & Whitney Twin Wasp, 1,050 hp. High speed 330 mph, cruising 295 mph. Normal range 1,100 mi.

Grumman G-37

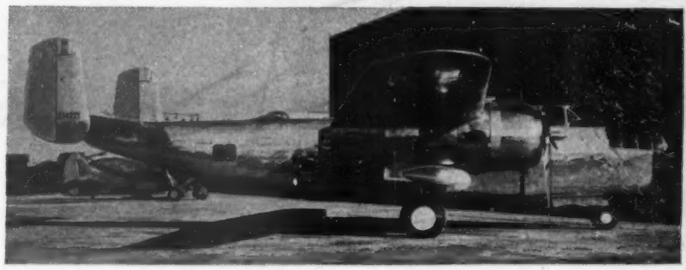
GRUMMAN'S G-37 single-place fighter has a 750 hp Wright Cyclone engine, high speed 270 mph, cruising 224 mph. Climbs 3,000 ft. per min. Service ceiling 32,000 ft.

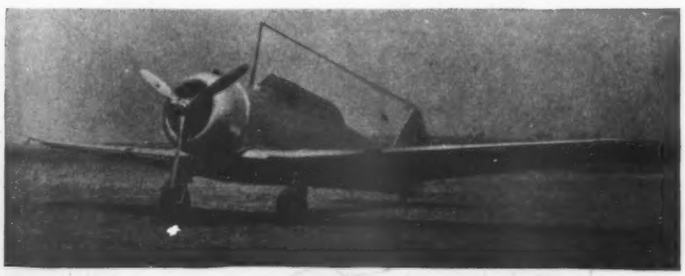
Glenn L. Martin 167-W

MARTIN'S Model 167-W bomber has two Pratt & Whitney Twin Wasps. High speed 310 mph, cruising 248 mph. Climb 1,790 ft. per min. Service ceiling 31,000 ft.

North American NA-40-A

NORTH AMERICAN'S 5-place Model NA-40-A is an advanced high-speed bomber with two Wright Cyclone engines totaling 2,550 hp. High speed 310 mph, cruising 256 mph.



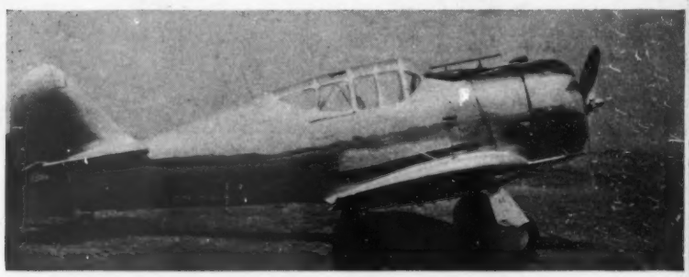


North American NA-44

THE NORTH AMERICAN Model NA-44 is designed as a light attack dive bomber, Wright Cyclone motor, top speed 250 mph, cruising 225 mph. Range 1,050 mi.

North American NA-50

NORTH AMERICAN'S NA-50 single-seater has a Wright Cyclone 840 hp engine and retractable gear. High speed 270 mph, cruising 235 mph. Service ceiling 31,500 ft.

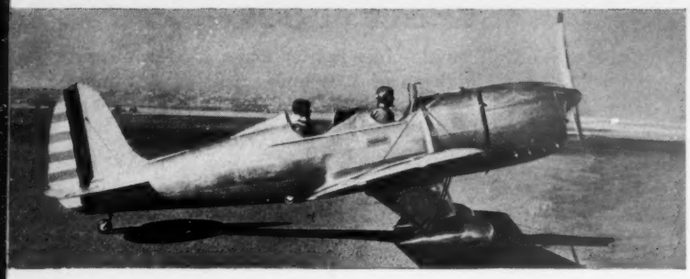


Republic EP-1 Model 100

REPUBLIC'S model 100 (EP-1) is an export version of the P35, with Pratt & Whitney 1,000 hp Twin Wasp engine. High speed 330 mph, cruising 240 mph. Range 2,700 mi.

Republic 2PA Model 200

THE REPUBLIC Model 200 (2PA) two-seater is powered with a 1,100 hp Pratt & Whitney Twin Wasp engine. High speed 315 mph, cruising 285 mph.

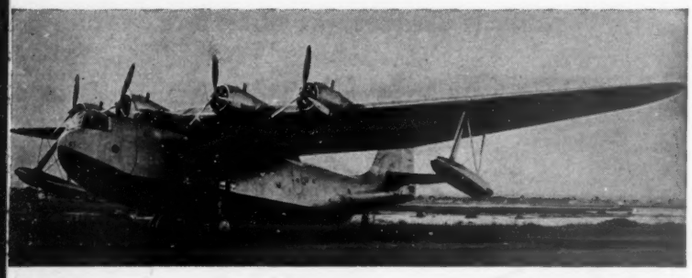


Ryan S-T-M

THE RYAN Model S-T-M military trainer is powered by a 150 hp Mėnasco. High speed 142 mph, cruising 128 mph. Climb 975 ft. per min. Service ceiling 18,600 ft.

Stearman A75L3

STEARMAN'S Model A75L3 biplane trainer is powered by a Lycoming 225 hp motor. Top speed 125 mph, cruising 103 mph. Service ceiling 13,200 ft., normal range 386 mi.

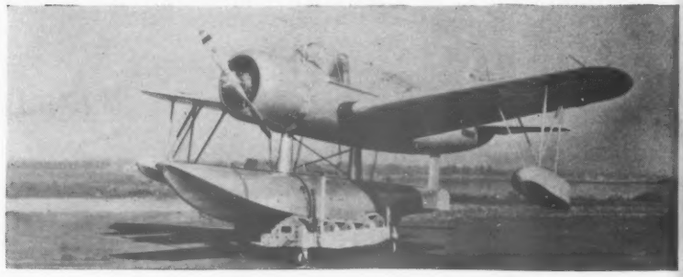


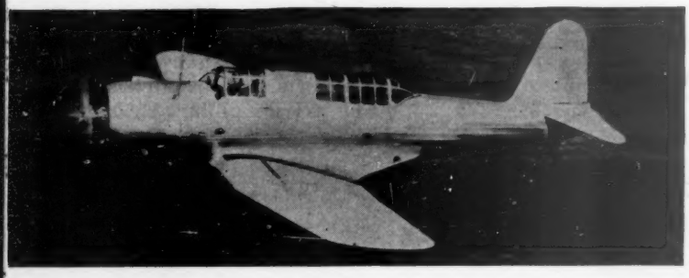
Vought-Sikorsky XPBS-1

THE VOUGHT-SIKORSKY Model XPBS-1 is a four engine patrol bomber which was built for the Navy. Performance figures, however, have not yet been released.

Vought-Sikorsky XSO2U-1

VOUGHT-SIKORSKY'S Model XSO2U-1 is a single-float seaplane equipped with wing floats. A Ranger engine supplies the power. Performance not released.



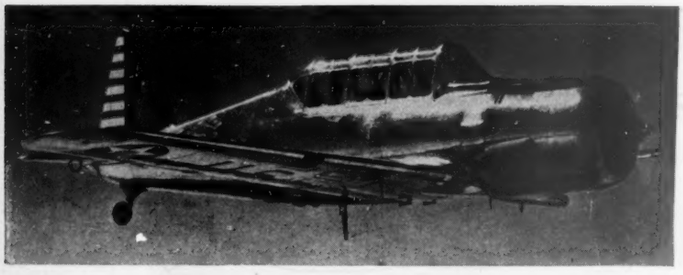


Vought-Sikorsky V-156

THE VOUGHT-SIKORSKY Model V-156 scout dive bomber was designed for the Navy. 750 hp Pratt & Whitney Junior Wasp engine. Specifications available on request.

Waco F-7

THE WACO Model F-7 (LPF-7) two-place biplane trainer has a Lycoming 220 hp engine, does 135 mph top speed, 105 mph cruising with service ceiling of 14,600 ft.

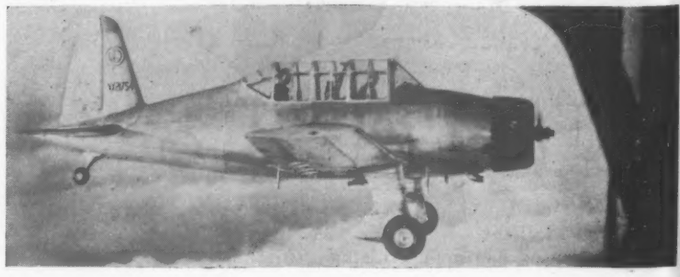


Vultee Valiant 51

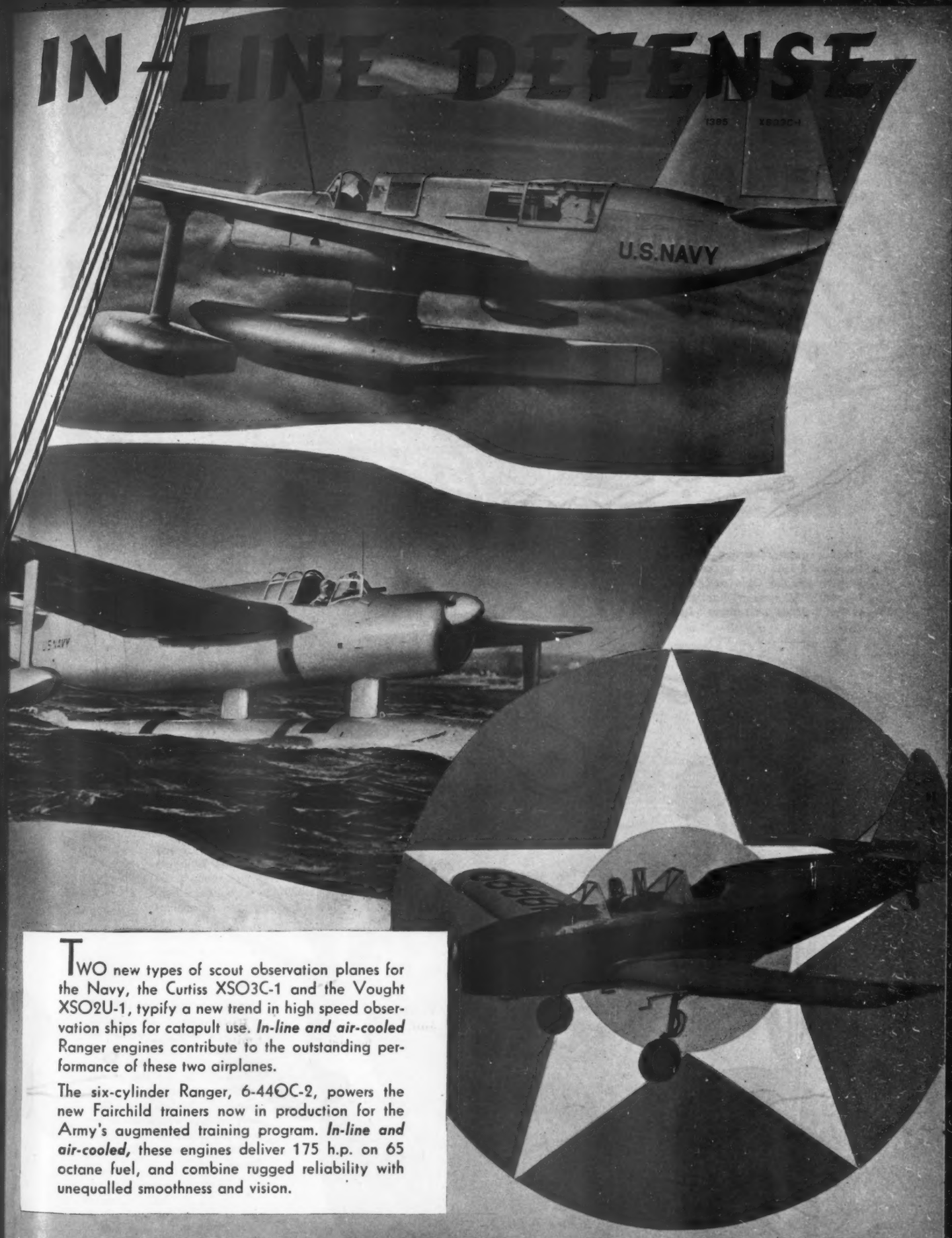
VULTEE'S Valiant 51 two-seater, all-metal monoplane is powered by a Pratt & Whitney 550 hp Wasp engine. Top speed 236 mph, cruising 213 mph. Normal range 900 mi.

Vultee Valiant 54

VULTEE'S Valiant 54 two-seater has a Pratt & Whitney Junior Wasp 450 hp engine. High speed 170 mph, cruising 143 mph, normal range 600 miles, service ceiling 21,000 ft.



IN-LINE DEFENSE



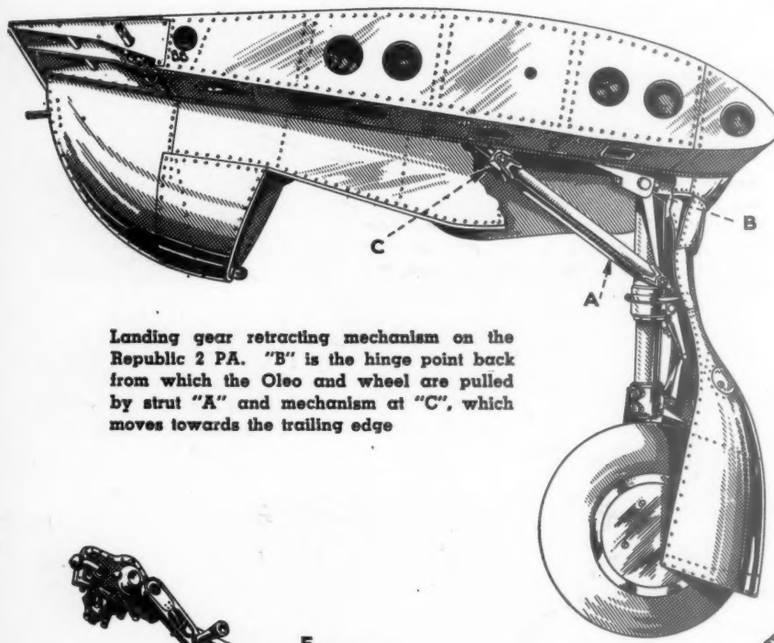
TWO new types of scout observation planes for the Navy, the Curtiss XSO3C-1 and the Vought XSO2U-1, typify a new trend in high speed observation ships for catapult use. ***In-line and air-cooled*** Ranger engines contribute to the outstanding performance of these two airplanes.

The six-cylinder Ranger, 6-440C-2, powers the new Fairchild trainers now in production for the Army's augmented training program. ***In-line and air-cooled,*** these engines deliver 175 h.p. on 65 octane fuel, and combine rugged reliability with unequalled smoothness and vision.

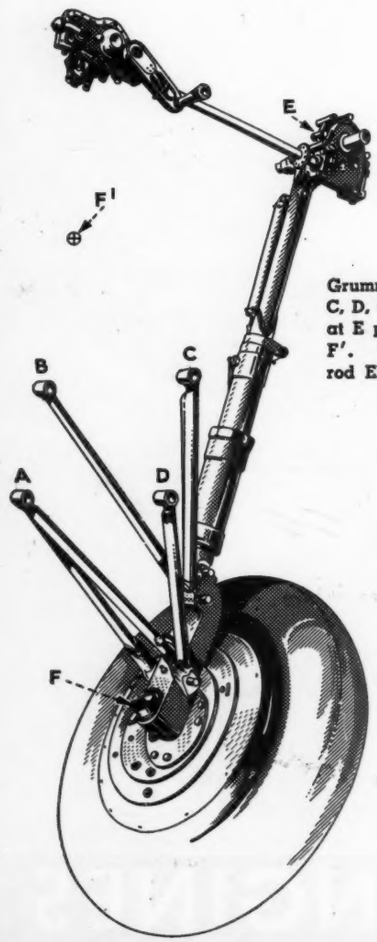
RANGER AIRCRAFT ENGINES

Division of Fairchild Engine and Airplane Corporation

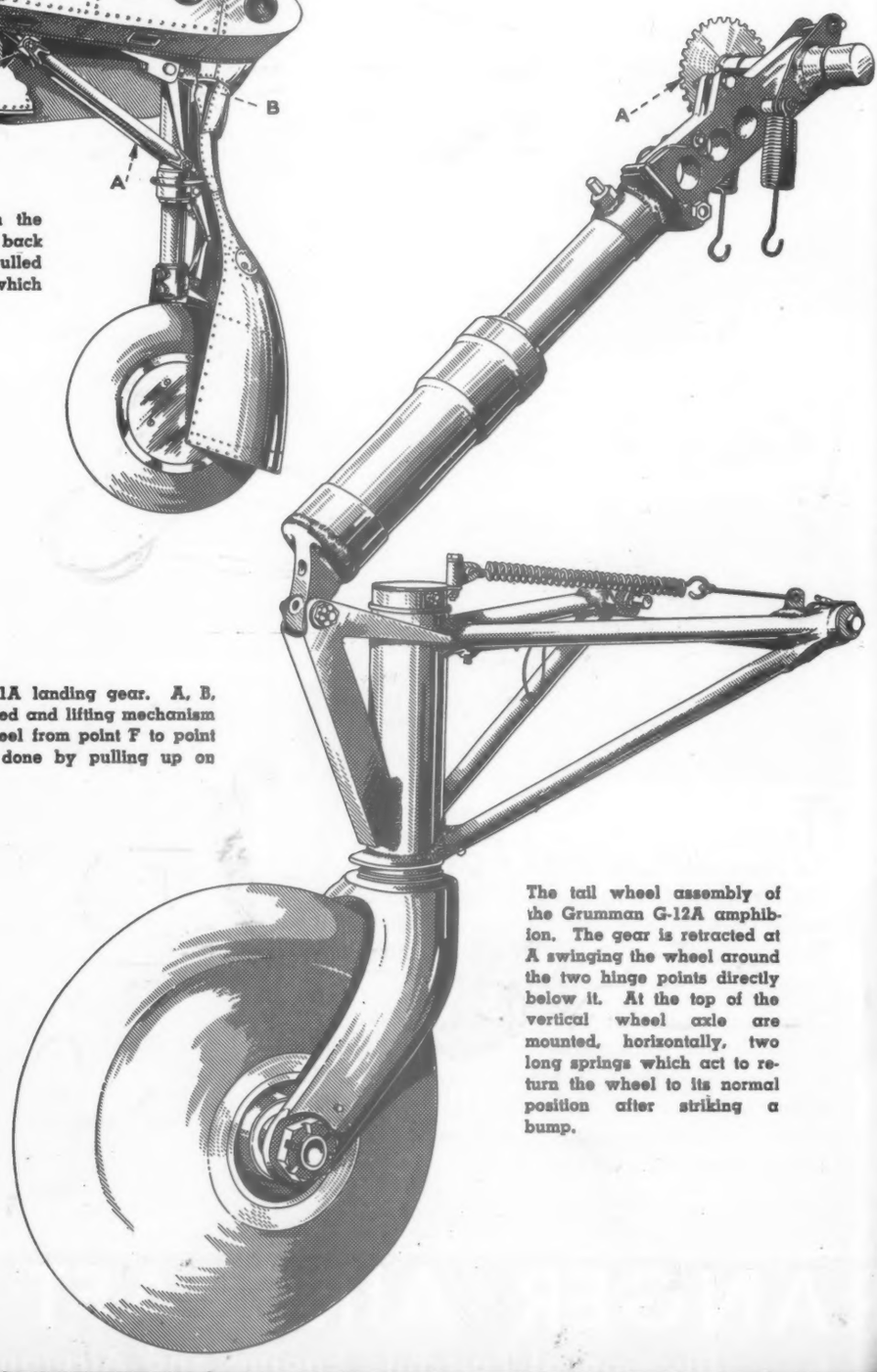
AVIATION SKETCH BOOK of DESIGN DETAIL



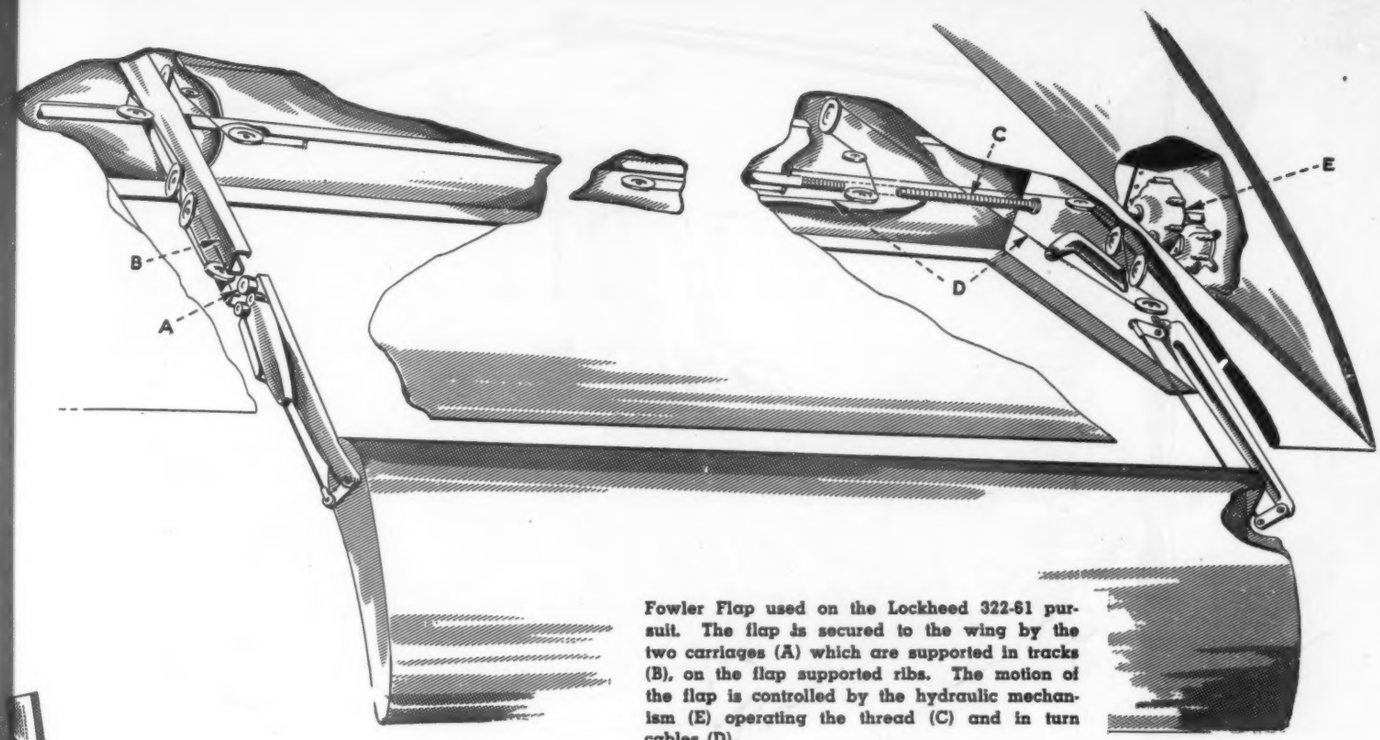
Landing gear retracting mechanism on the Republic 2 PA. "B" is the hinge point back from which the Oleo and wheel are pulled by strut "A" and mechanism at "C", which moves towards the trailing edge



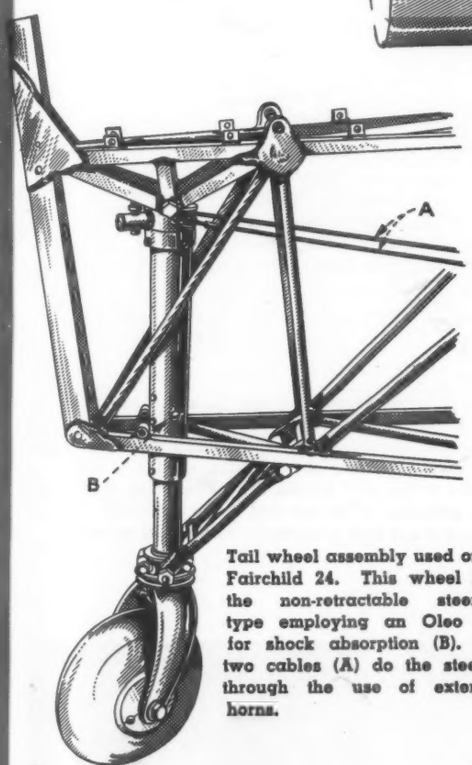
Grumman G-21A landing gear. A, B, C, D, are hinged and lifting mechanism at E pulls wheel from point F to point F'. This is done by pulling up on rod EF.



The tail wheel assembly of the Grumman G-12A amphibion. The gear is retracted at A swinging the wheel around the two hinge points directly below it. At the top of the vertical wheel axle are mounted, horizontally, two long springs which act to return the wheel to its normal position after striking a bump.

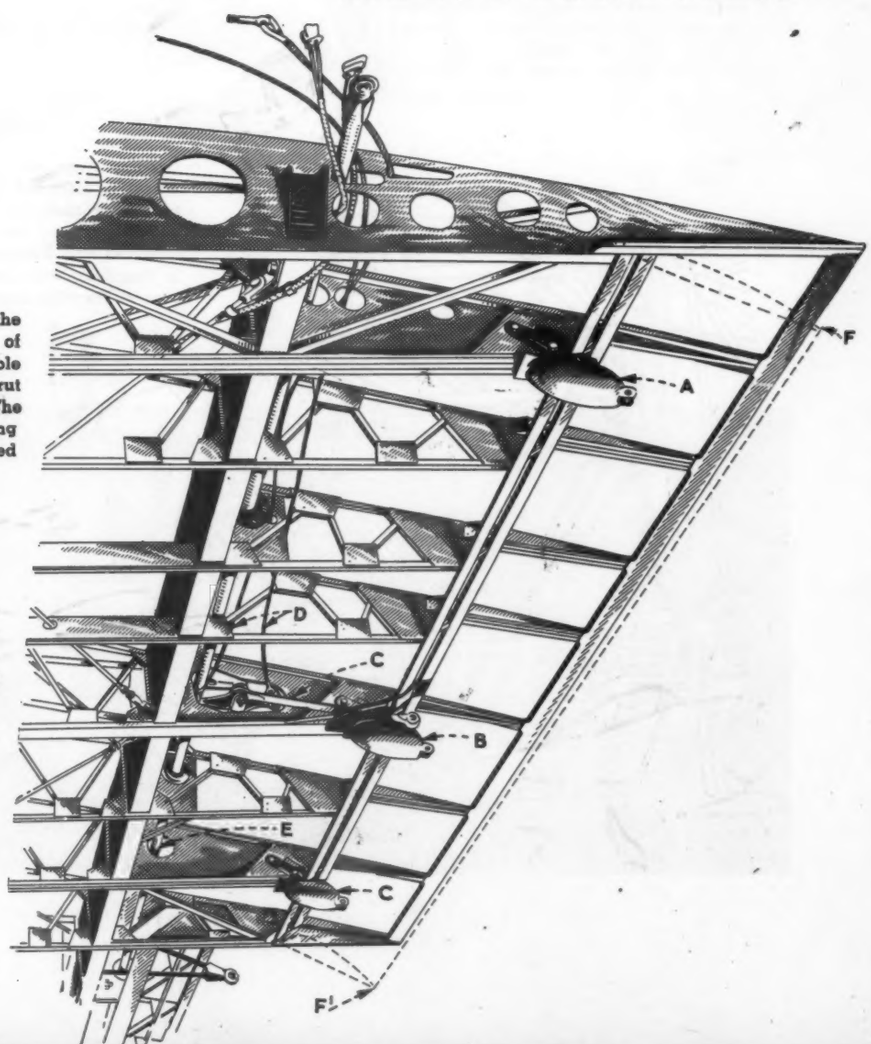


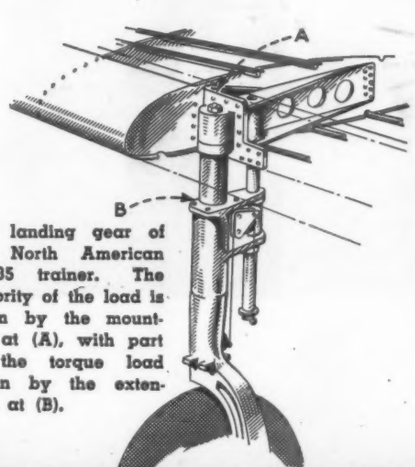
Fowler Flap used on the Lockheed 322-61 pursuit. The flap is secured to the wing by the two carriages (A) which are supported in tracks (B), on the flap supported ribs. The motion of the flap is controlled by the hydraulic mechanism (E) operating the thread (C) and in turn cables (D).



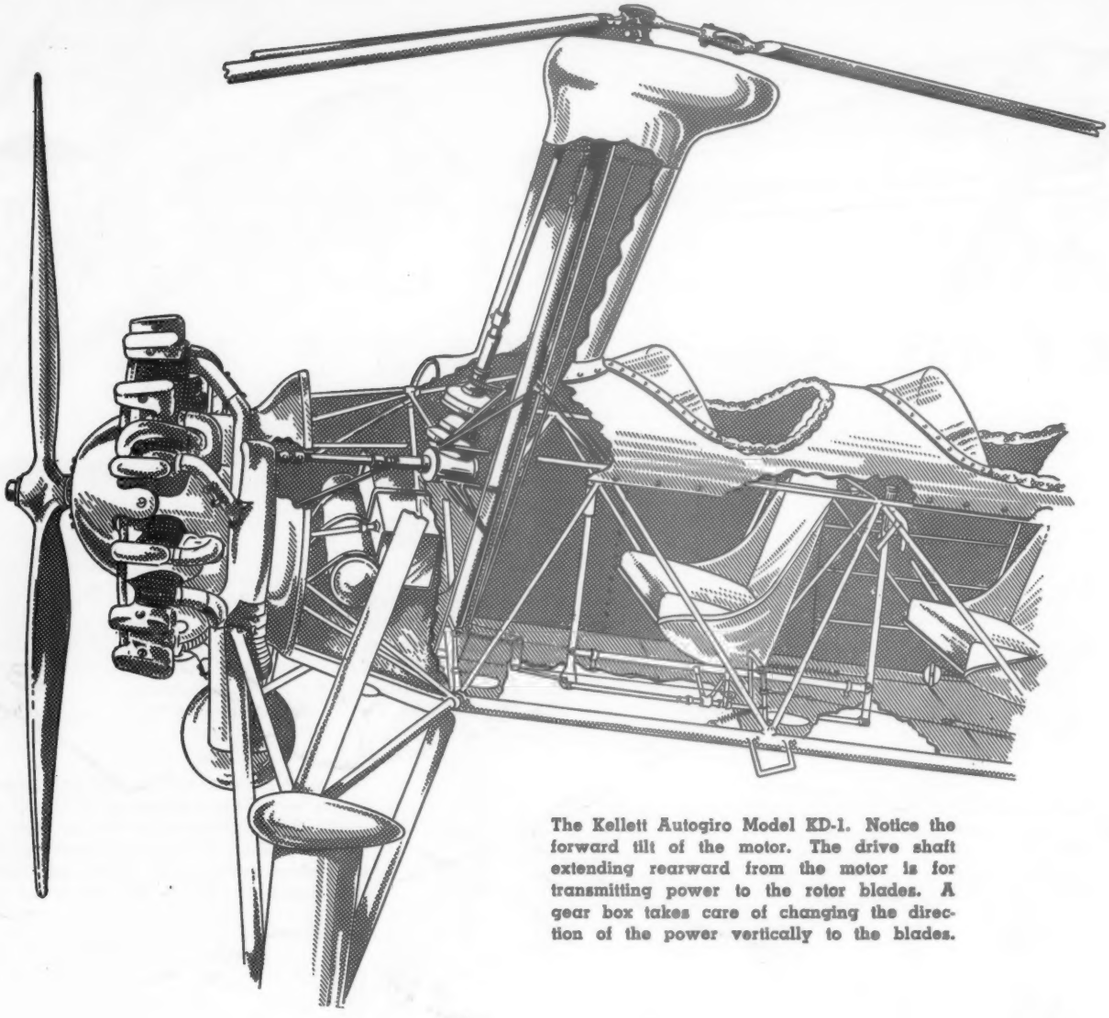
Tail wheel assembly used on the Fairchild 24. This wheel is of the non-retractable steerable type employing an Oleo strut for shock absorption (B). The two cables (A) do the steering through the use of extended horns.

Flap mechanism in the Fairchild 24. Split type with the hinges at the three points A, B, C, the control of the mechanism is accomplished by the lever C at the center hinge which in turn is actuated positively by the two cables extending to the fuselage (D), being operated manually. FF′ is the flap in the down position.

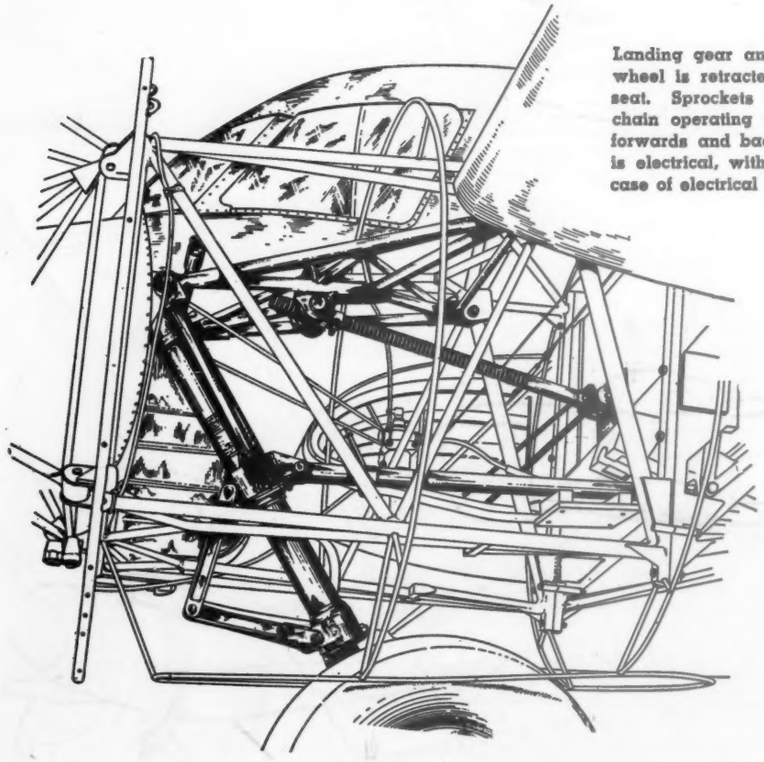




The landing gear of the North American NA-35 trainer. The majority of the load is taken by the mounting at (A), with part of the torque load taken by the extension at (B).

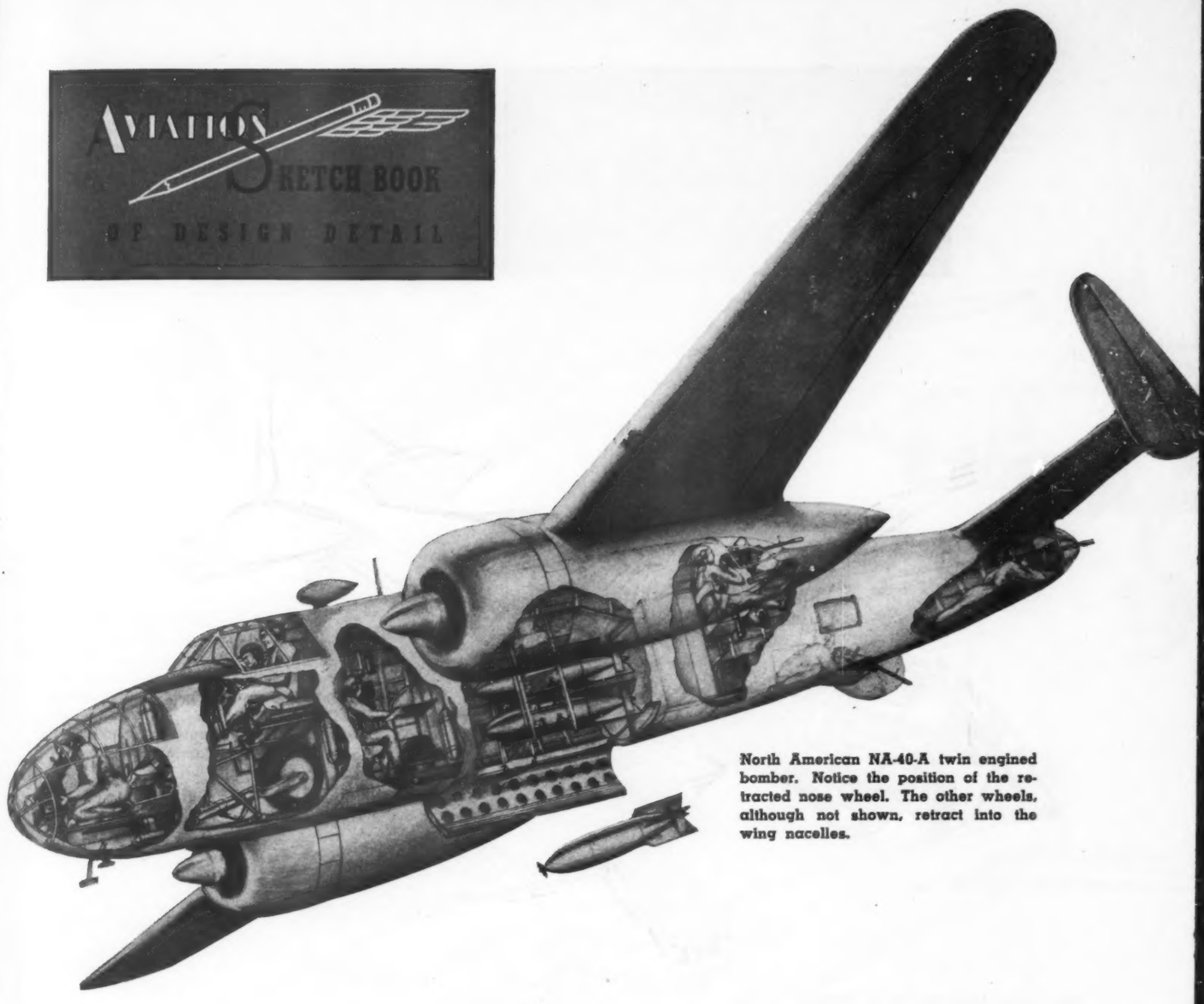


The Kellett Autogiro Model KD-1. Notice the forward tilt of the motor. The drive shaft extending rearward from the motor is for transmitting power to the rotor blades. A gear box takes care of changing the direction of the power vertically to the blades.



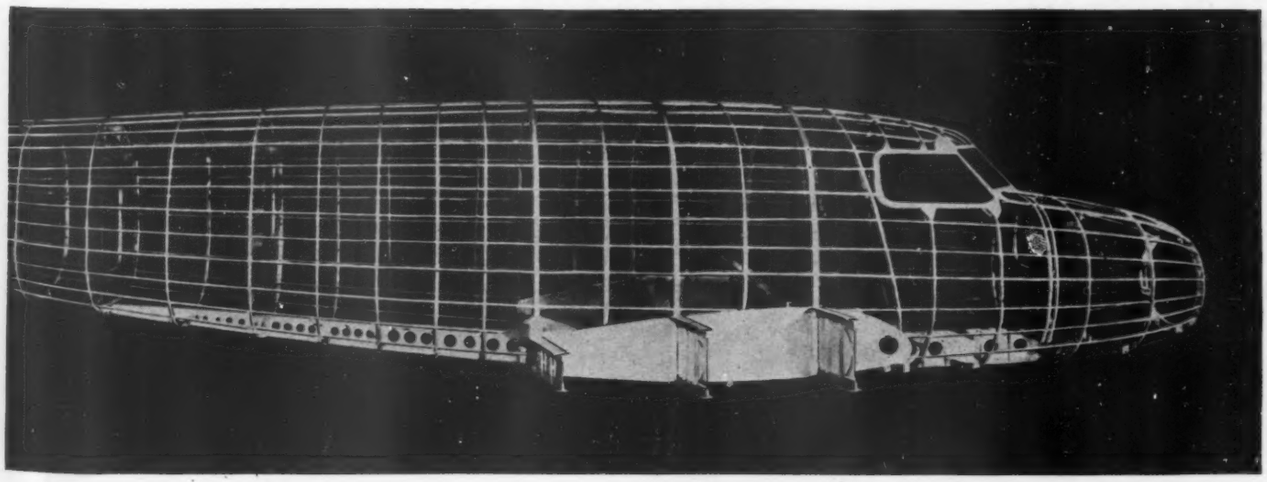
Landing gear and retracting mechanism on the Cessna T-50. The wheel is retracted by a retractive motor located under the pilot's seat. Sprockets are located on the motor shaft which drives the chain operating the screws. Running the carriage on the screw, forwards and backwards, raises and lowers the wheel. The motor is electrical, with limit switches in the up and down positions. In case of electrical failure there is also a separate mechanical system.

AVIATION SKETCH BOOK OF DESIGN DETAIL

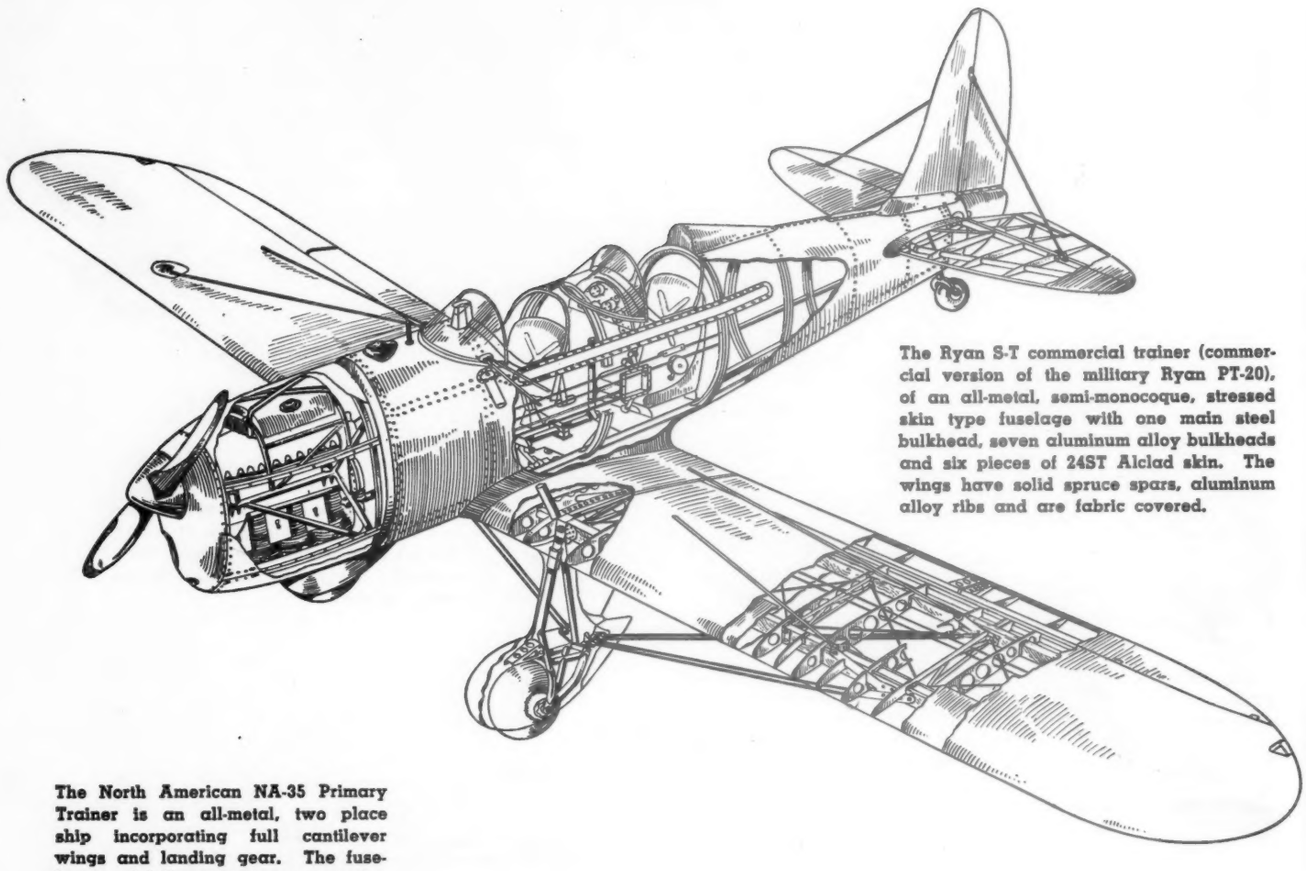


North American NA-40-A twin engined bomber. Notice the position of the retracted nose wheel. The other wheels, although not shown, retract into the wing nacelles.

The frame of the Barkley-Grow T8P-1. This is the same construction used on the BT-1 with the exception that the wing is two spar instead of three spar.

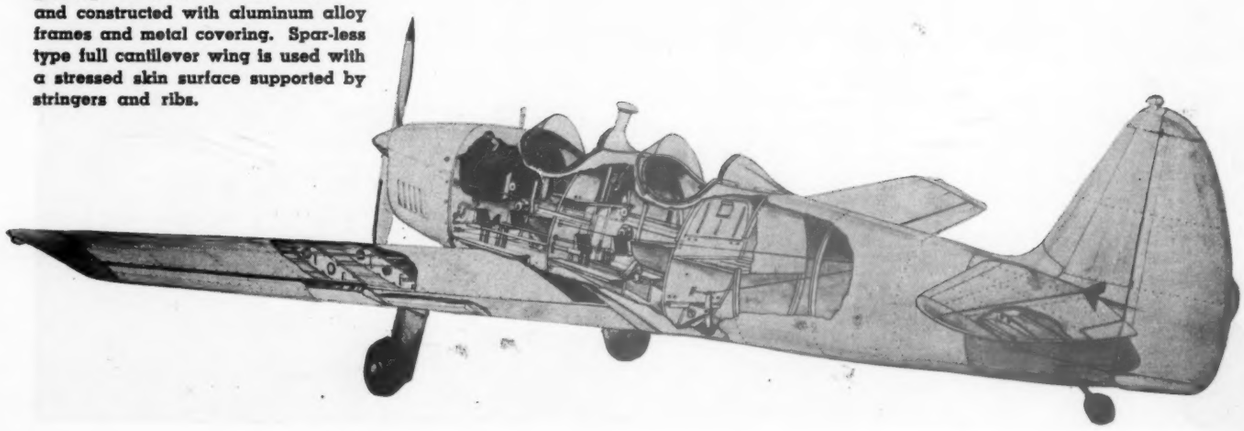


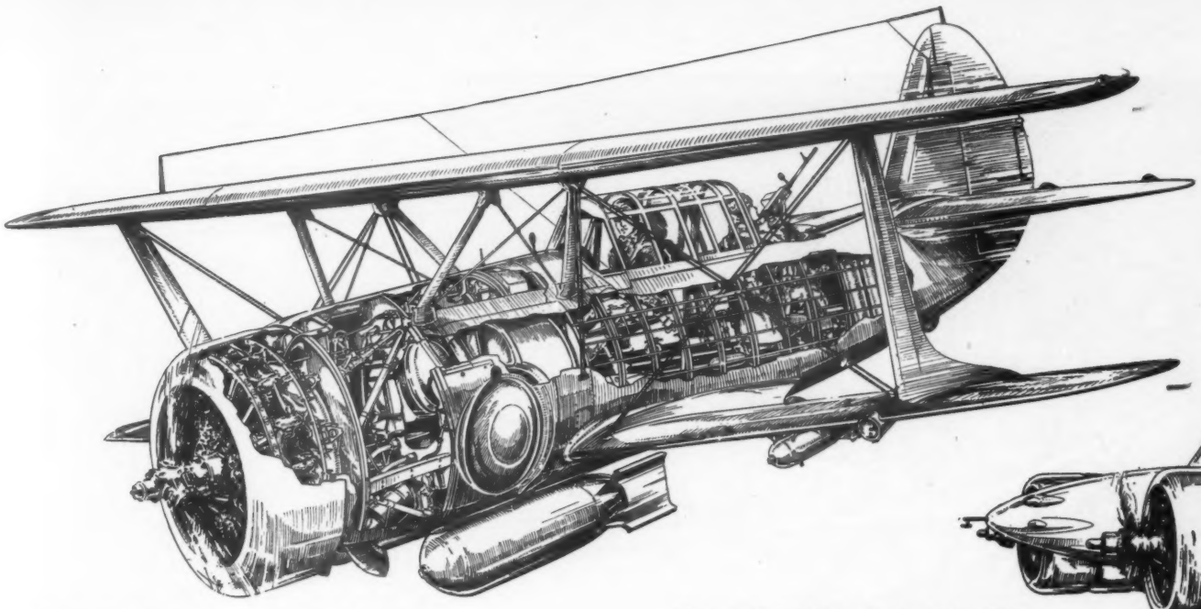
AVIATION'S SKETCH BOOK OF DESIGN DETAIL



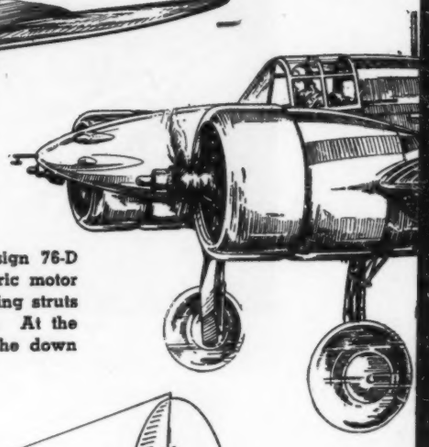
The Ryan S-T commercial trainer (commercial version of the military Ryan PT-20), of an all-metal, semi-monocoque, stressed skin type fuselage with one main steel bulkhead, seven aluminum alloy bulkheads and six pieces of 24ST Alclad skin. The wings have solid spruce spars, aluminum alloy ribs and are fabric covered.

The North American NA-35 Primary Trainer is an all-metal, two place ship incorporating full cantilever wings and landing gear. The fuselage is of full monocoque construction with one aluminum alloy bulkhead directly aft of each cockpit. All empennage surfaces are full cantilever and constructed with aluminum alloy frames and metal covering. Spar-less type full cantilever wing is used with a stressed skin surface supported by stringers and ribs.

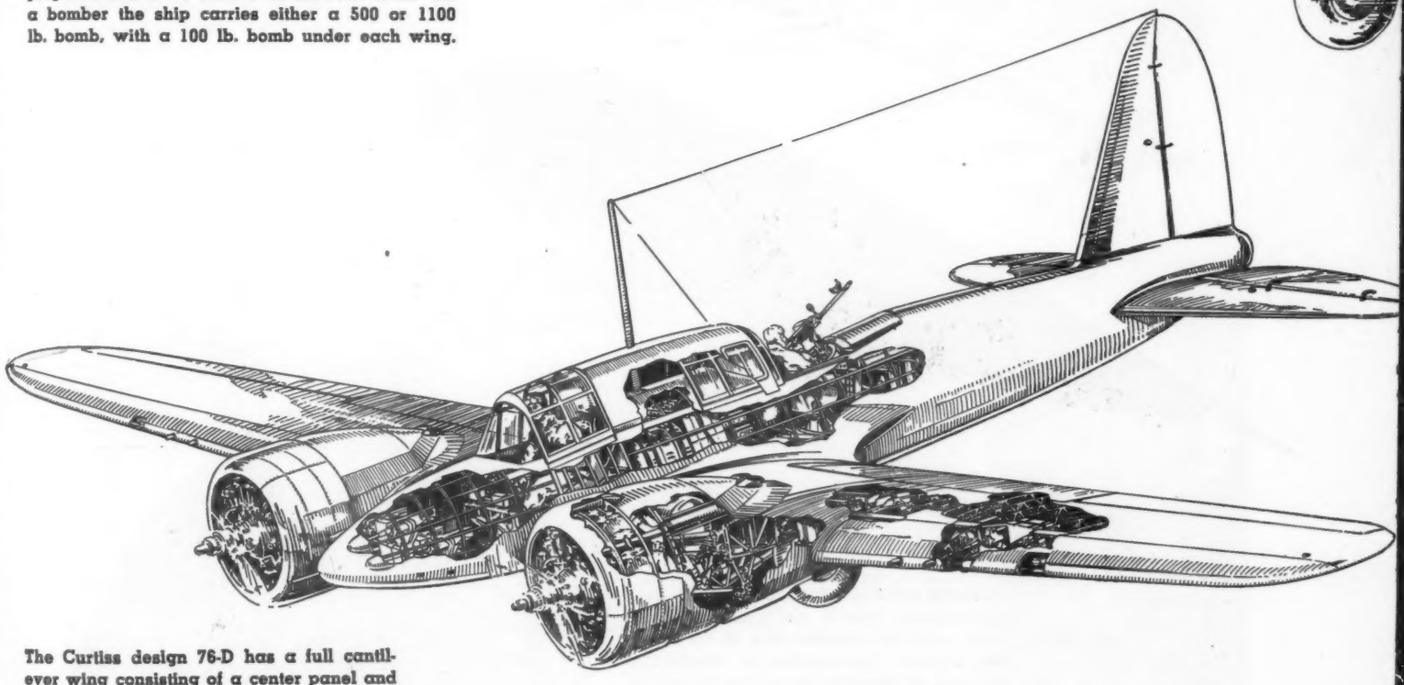




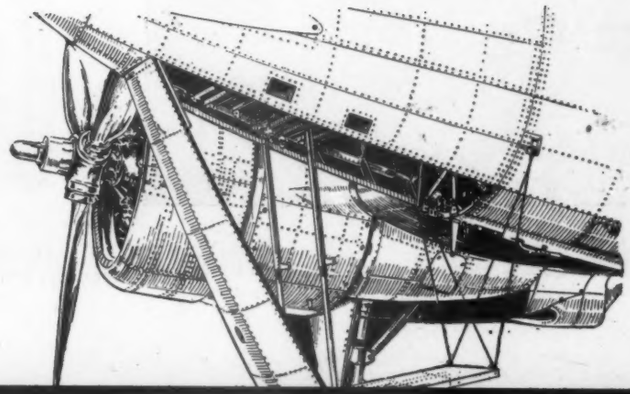
The Curtiss Helldiver -77 is in general of all-metal construction and covering with the exception of the lower wing and control surfaces, which are fabric covered. The ship carries a .30 or .50 calibre machine gun firing through the propeller and a .30 calibre on the rear deck. As a bomber the ship carries either a 500 or 1100 lb. bomb, with a 100 lb. bomb under each wing.



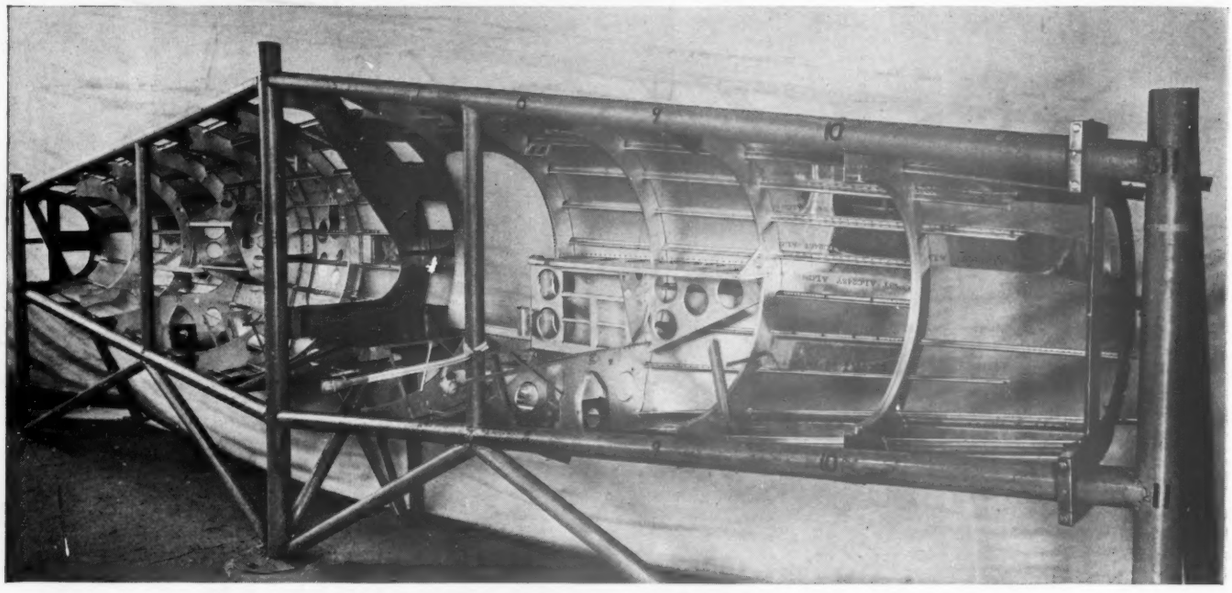
The undercarriage of the design 76-D retract by means of an electric motor driven hydraulic pump operating struts with automatic integral locks. At the right is the landing gear in the down position.



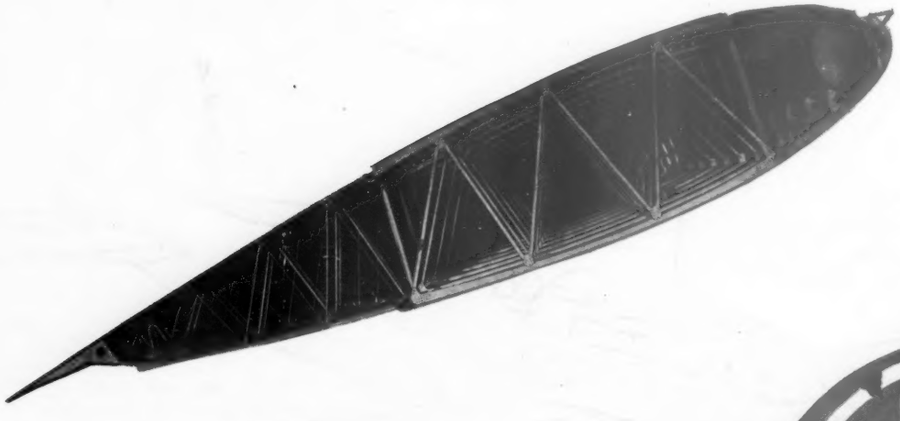
The Curtiss design 76-D has a full cantilever wing consisting of a center panel and two detachable outer panels. The all-metal fuselage is of semi-monocoque construction covered with Alclad aluminum alloy stressed skin.



The Curtiss design 76-D carries four fixed .30 calibre machine guns in the nose. At the right is shown the gun charging platform in the nose extended for servicing and reloading the guns.



Partially completed fuselage of the Republic 2 P A. Notice the use of the "Z" section stringers that are free from the bulkheads, the skin transferring the loads to the bulkheads.

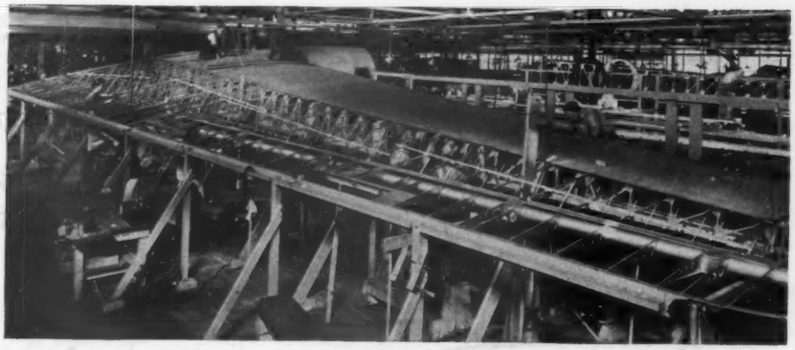


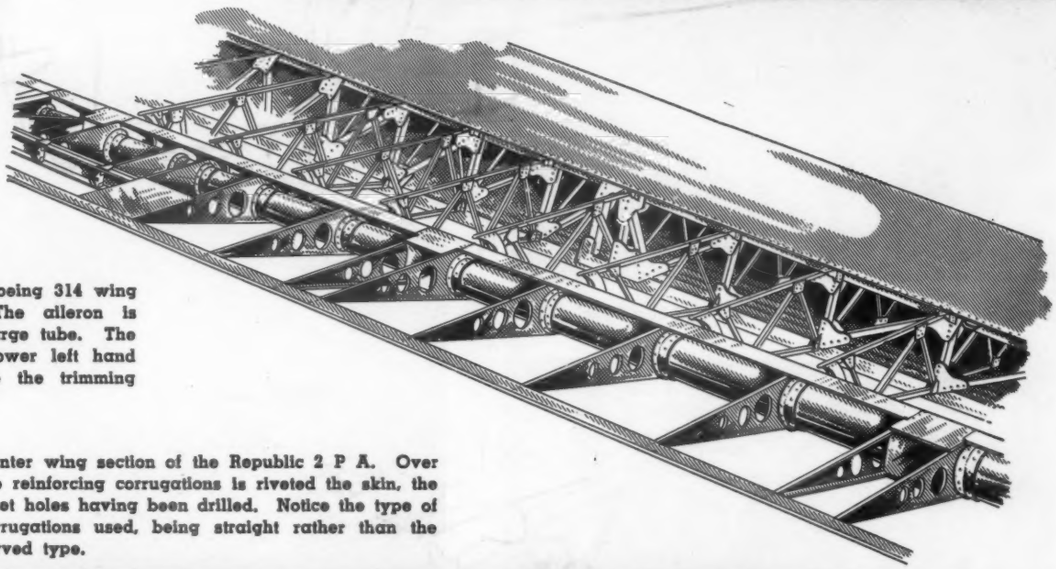
A cross section of the wing of the Boeing 314 clipper showing the gangway for the crew to inspect the inboard and outboard motors, just in rear of the gas tanks.

Partially covered wing tip of the Boeing 314 clipper. Notice the semi-circular jig used with the wooden form of the rib at the bottom. This section is attached to the end of the wing shown on the top of the following page.

AVIATION SKETCH BOOK
OF DESIGN DETAIL

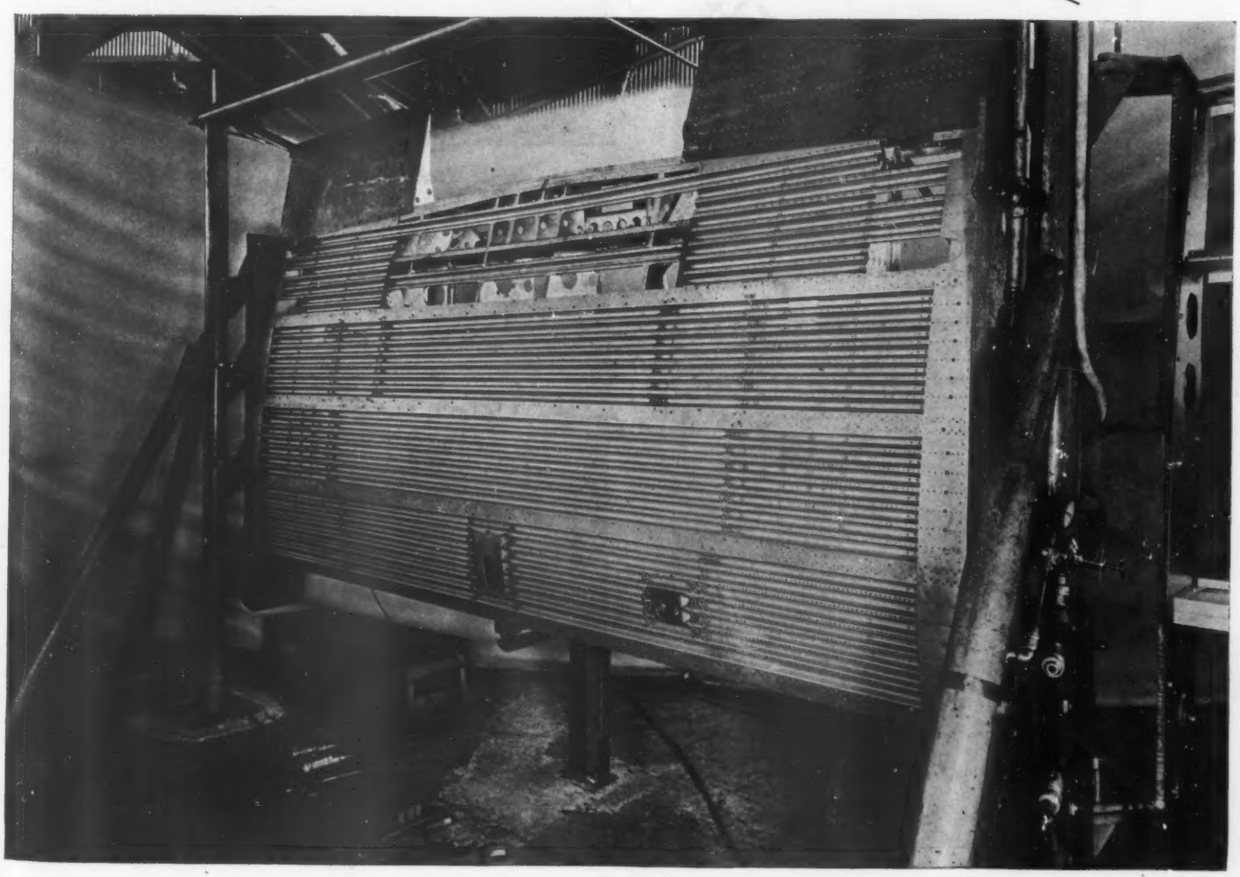
The partially covered wing of the Boeing 314 clipper. The inside surface of the covering is reinforced with corrugated aluminum alloy. The aileron hinge bar has been installed as shown in the lower right. This section has been sketched in the drawing below.





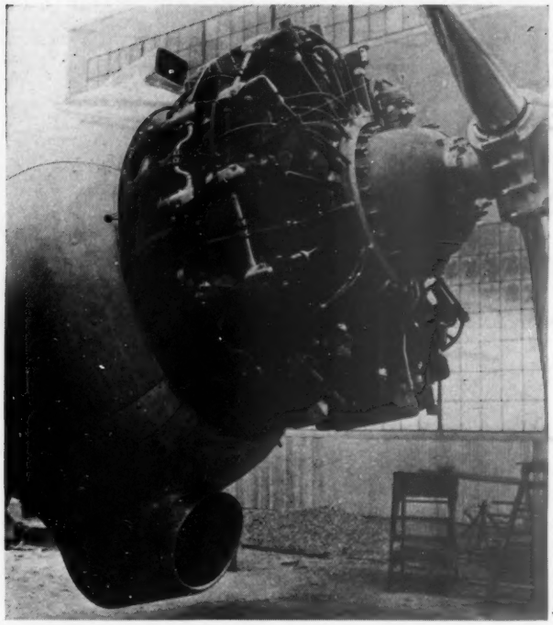
Section of the Boeing 314 wing and aileron. The aileron is turned by the large tube. The section at the lower left hand corner is where the trimming tab is located.

Center wing section of the Republic 2 P A. Over the reinforcing corrugations is riveted the skin, the rivet holes having been drilled. Notice the type of corrugations used, being straight rather than the curved type.

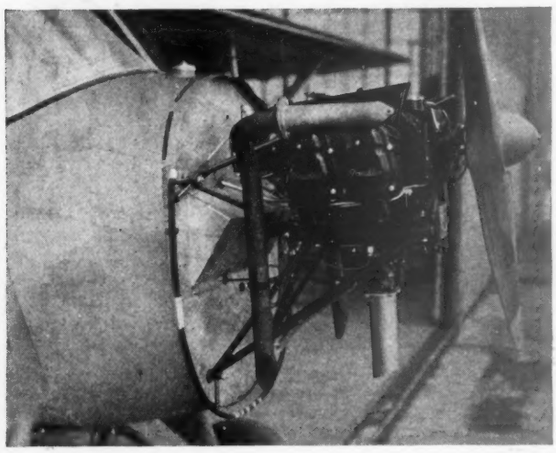


ENGINES FOR 1940

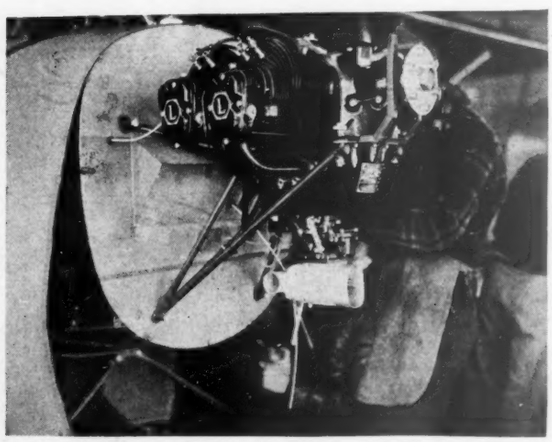
Showing representative engines and for latest type of planes



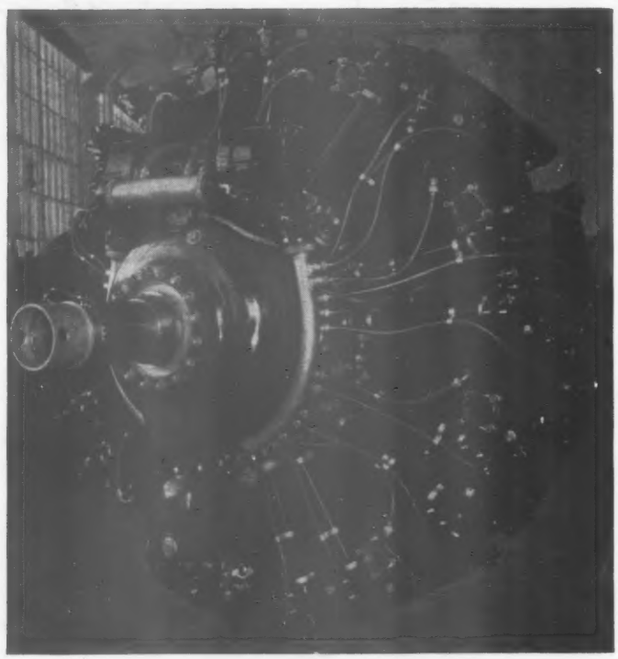
The Pratt & Whitney Model 1830-C installed in a Douglas DC-3.



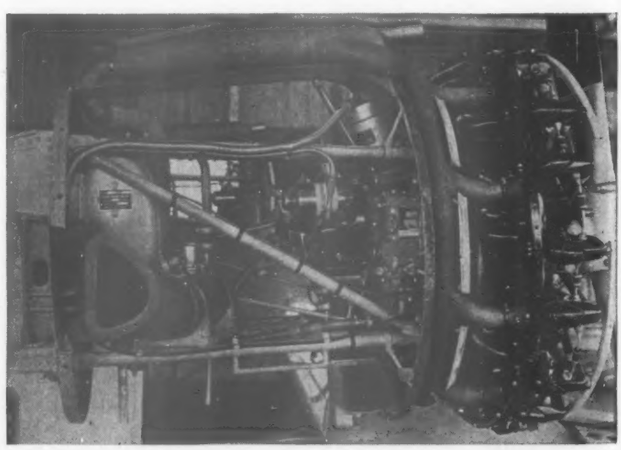
Franklin engine installed in an Aeronca



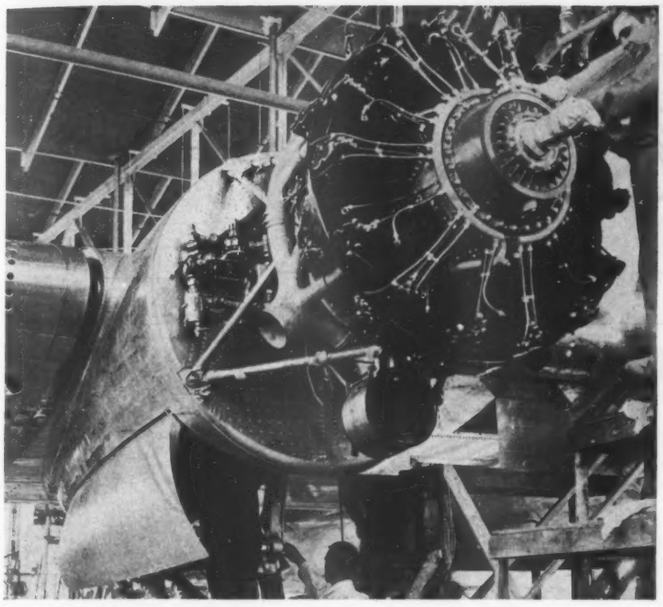
Typical light plane Lycoming installation



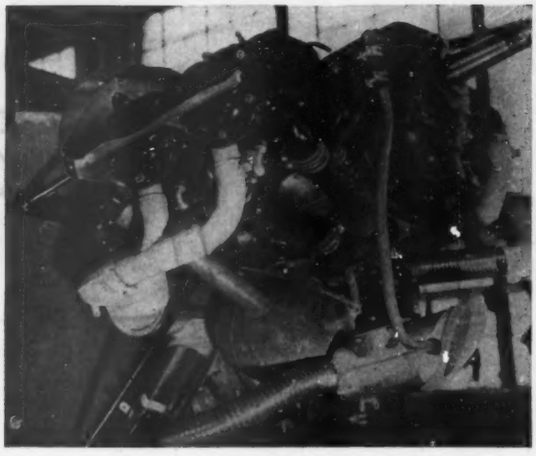
The 18 cylinder Wright Duplex Cyclone of 2,000 h.p. Two of which were installed in the 52-passenger Consolidated Model 31 Long Range Flying Boat.



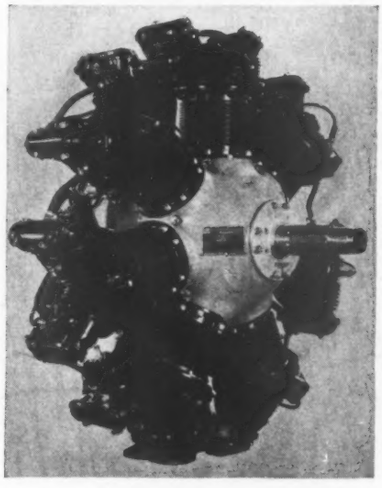
The Pratt & Whitney Wasp, Jr., SB installation in a Grumman G-21 Amphibian



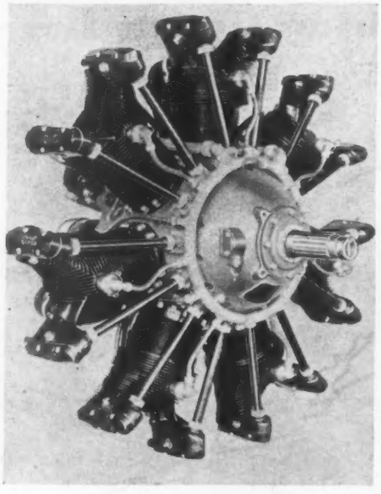
The Double-Row Cyclone installation in the new 36-passenger Curtiss-Wright Substratosphere Transport.



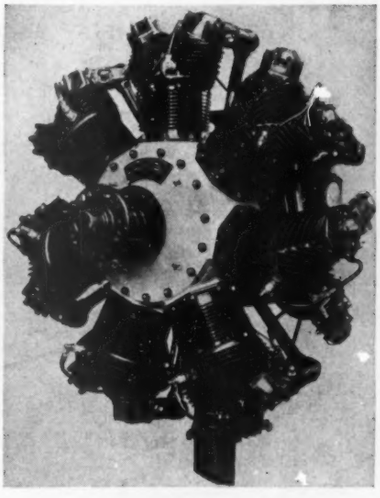
A Continental A65-8 in a Cub Coupe



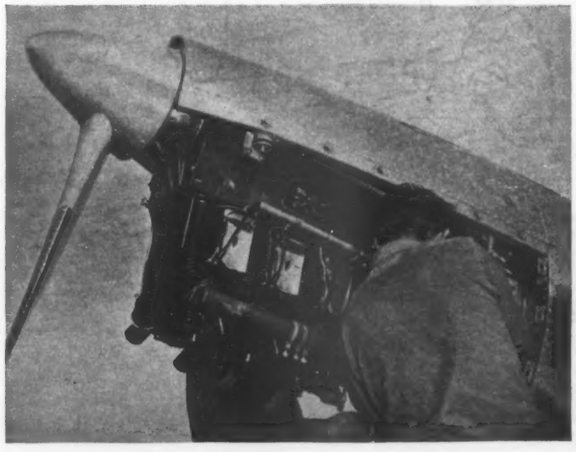
Warner Model 165 Super Scarab



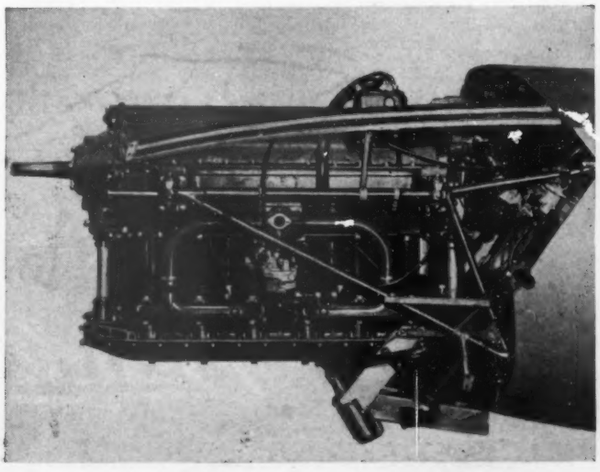
Jacobs Model L-4MB



Rearwin's Ken-Royce 7-F



The Menasco Pirate in a North American NA-35 Trainer



Ranger's 6-410B-3 installed in a Fairchild F-24R9

we ask you . . . . . .
ask the man who FLYS one*

★ The most popular light plane engine in the country today is Franklin! For proof—we paraphrase this famous slogan —and again ask you . . . ask the man who **FLYS one!**

AIRCOOLED MOTORS CORPORATION ★ SYRACUSE, N. Y.

** with bouquets to Packard*

American Aircraft Engine Specifications

AVIATION does not assume responsibility for the figures given

Manufacturer	Model	Cooling system	Number of cylinders	Cylinder arrangement	Propeller drive	Rating: Rated hp.	Rating: At r.p.m.	Rating: At altitude (ft.)	Rating: Octane fuel	Weights: Total dry without hub or starter	Weights: Lb. per hp.	Bore and stroke (in.)	Displacement (cu. in.)	Compression ratio	B.M.E.P.	Blower ratio	Dimensions: Diam. mount. ring or distance between bearers	Dimensions: Ht. or O.D. (in.)	Dimensions: Length without starter	Guaranteed fuel consumption at rated hp. (lb. per hp.-hr.)	Oil consumption (lb. per hp.-hr.)	Valve* mechanism	Cylinder construction (See footnote)	Make spark plugs supplied with engine	Type ignition	Make ignition	Make of carburetors	Make of starter	Are exhaust manifolds provided	Shipping weight crated (lb.)	D. of C. license number
Aeronautical Corp. of America..	E-113C	A	2	HOpp	D	40	2540	S.L.	73	117	2.9	4¼x4	113.5	5.4	158	.....	.....	18	24	.55	.006	prr	Al,S	Op	M	B	Sg	.....	.....	210	71
Aeronautical Corp. of America..	E-113CBD	A	2	HOpp	D	45	2500	S.L.	73	125	2.8	4¼x4	113.5	5.4	181	.....	.....	18	24	.58	.006	prr	Al,S	Op	2M	B	Sg	.....	.....	218	189
Aircooled Motors (Franklin)....	4AC-150	A	4	HOpp	D	50	2300	S.L.	70	158	.....	3⅝x3⅝	150.0	6.6	.....	.....	10"	18⅜	127	.54	.00296	prr	Al-Ni	Ch	M	Eise	Marvel	.....	Yes	....	194
Aircooled Motors (Franklin)....	4 AC-150 (Dual)	A	4	HOpp	D	50	2300	S.L.	70 min.	161	.....	3⅝x3⅝	150.0	5.5	.....	.....	10"	18⅜	126 17/32	.54	.00296	prr	Al-Ni	Ch	M	Eise	Marvel	.....	Yes	....	194
Aircooled Motors (Franklin)....	4AC-171	A	4	HOpp	D	60	2350	S.L.	70	158	.....	3⅞x3⅝	171.0	6.25	.....	.....	10"	18⅜	127	.60	.00347	prr	Al-Ni	Ch	M	Eise	Marvel	.....	Yes	....	206
Aircooled Motors (Franklin)....	4AC-171 (Dual)	A	4	HOpp	D	60	2350	S.L.	70 min.	161	.....	3⅞x3⅝	171.0	6.25	.....	.....	10"	18⅜	126 17/32	.60	.00347	prr	Al-Ni	Ch	M	Eise	Marvel	.....	Yes	....	206
Aircooled Motors (Franklin)....	4AC-171	A	4	HOpp	D	60	2350	S.L.	70 min.	204	.....	3⅞x3⅝	171.0	6.25	.....	.....	10"	22 3/16	128 9/16	.60	.00347	prr	Al-Ni	Ch	M Gen	Eise Au-lit	Marvel	Auto-lite	Yes	....	206
Akron Aircraft Co.	Funk E200-E4L	W	4	Lid	D	63	2125	S.L.	70	260	3.7	3⅞x4¼	200.5	6.25	116.7	.....	.....	25	35	.592	.0035	Lh	C	B	M	B	Z	.....	.....	.....	201
Allison Engrg. Co.	V-1710-C6	W	12	V	G[5]	1000	2600	S.L.	87	1280	1.28	5½x6	1710.5	6.00	178	6.75	18⅜	42 19/32	94 15/32	.60	.025	ohc[2]	Al,S	BG	DM	Sc	Sg	Ec	No	1970	177
American Aircraft Co.	S-5-125	A	5	Rad	D	125	1950	S.L.	74	325	2.40	4.75x5	440.5	5.00	.....	.....	16⅜	40	24	.55	.015	prr	NI	Op	B	Bat	Sg,Hy	Own	Op	450	181
Aviation Mfg. Corp. (Lycoming)	O-145-A1	A	4	HOpp	D	50	2300	S.L.	73	152	3.04	3.625x3.5	144.5	5.65	119	.....	.....[2]	20.59	23.75	.55[3]	.010	prr	Al,Ca[4]	ES	M	Sc	Marvel	.....	No	198	199
Aviation Mfg. Corp. (Lycoming)	O-145-A2	A	4	HOpp	D	55	2300	S.L.	73	162	2.95	3.625x3.5	144.5	5.65	119	.....	.....[2]	20.59	24.63	.55	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	.....	No	208	199
Aviation Mfg. Corp. (Lycoming)	O-145-A3	A	4	HOpp	D	55	2300	S.L.	73	164	2.98	3.625x3.5	144.5	5.65	119	.....	.....[2]	22.59	24.63	.55	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	Ec	No	215	199
Aviation Mfg. Corp. (Lycoming)	R-530-D1	A	7	Rad	D	220	2300	S.L.	80	430.0	1.95	4.625x4.5	529.2	6.5	143.0	1.0	19.25	43.5	34.26	.52[3]	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	967	182
Aviation Mfg. Corp. (Lycoming)	R-530-D2	A	7	Rad	D	210	2300	S.L.	73	430.0	2.05	4.625x4.5	529.2	5.5	137.0	1.0	19.25	43.5	34.26	.52	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	967	183
Aviation Mfg. Corp. (Lycoming)	R-680-B4C	A	9	Rad	D	225	2100	S.L.	73	492.0	2.19	4.625x4.5	680.4	5.5	125.0	1.0	19.25	43.5	37.09	.52	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	1029	108
Aviation Mfg. Corp. (Lycoming)	R-680-D5	A	9	Rad	D	260	2300	S.L.	80	505.0	1.94	4.625x4.5	680.4	6.5	132.0	1.0	19.25	43.5	37.04	.50	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	1042	172
Aviation Mfg. Corp. (Lycoming)	R-680-D6	A	9	Rad	D	245	2300	S.L.	73	505.0	2.06	4.625x4.5	680.4	5.5	124.0	1.0	19.25	43.5	37.04	.50	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	1042	173
Aviation Mfg. Corp. (Lycoming)	R-680-E1	A	9	Rad	D	290	2300	S.L.	80	514.0	1.77	4.625x4.5	680.4	6.2	147.0	1.0	19.25	43.5	37.04	.50	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	1051	202
Aviation Mfg. Corp. (Lycoming)	R-680-E2	A	9	Rad	D	280	2300	S.L.	73	514.0	1.84	4.625x4.5	680.4	5.5	142.0	1.0	19.25	43.5	37.04	.50	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	1051	202
Aviation Mfg. Corp. (Lycoming)	R-680-E3	A	9	Rad	D	300	2300	S.L.	87	514.0	1.71	4.625x4.5	680.4	7.0	152.0	1.0	19.25	43.5	37.04	.50	.020	prr	Al,S	BG	DM	Sc	Sg	Ec	No	1051	202
Aviation Mfg. Corp. (Lycoming)	O-145-B1	A	4	HOpp	D	65	2550	S.L.	73	155.0	2.38	3.625x3.5	144.5	6.5	140.0	.....	.....[2]	20.59	23.75	.50[3]	.010	prr	Al,Ca[4]	ES	M	Sc	Marvel	.....	No	201	210
Aviation Mfg. Corp. (Lycoming)	O-145-B2	A	4	HOpp	D	65	2550	S.L.	73	165.5	2.55	3.625x3.5	144.5	6.5	140.0	.....	.....[2]	20.59	24.63	.50[3]	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	.....	No	211	210
Aviation Mfg. Corp. (Lycoming)	O-145-B3	A	4	HOpp	D	65	2550	S.L.	73	167.5	2.58	3.625x3.5	144.5	6.5	140.0	.....	.....[2]	22.59	24.63	.50[3]	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	Ec	No	218	210
Aviation Mfg. Corp. (Lycoming)	O-145-C1	A	4	HOpp	D	75	3100	S.L.	73	155.0	2.07	3.625x3.5	144.5	6.5	133.0	.....	.....[2]	20.59	23.75	.50[3]	.010	prr	Al,Ca[4]	ES	M	Sc	Marvel	.....	No	201	210
Aviation Mfg. Corp. (Lycoming)	O-145-C2	A	4	HOpp	D	75	3100	S.L.	73	165.5	2.21	3.625x3.5	144.5	6.5	133.0	.....	.....[2]	20.59	24.63	.50[3]	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	.....	No	211	210
Aviation Mfg. Corp. (Lycoming)	O-145-C3	A	4	HOpp	D	75	3100	S.L.	73	167.5	2.23	3.625x3.5	144.5	6.5	133.0	.....	.....[2]	22.59	24.63	.50[3]	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	Ec	No	218	210
Aviation Mfg. Corp. (Lycoming)	GO-145-C1	A	4	HOpp	G	75	3200	S.L.	73	181.0	2.41	3.625x3.5	144.5	6.5	128.0	.....	.....[2]	20.59	28.44	.50[3]	.010	prr	Al,Ca[4]	ES	M	Sc	Marvel	.....	No	238	210
Aviation Mfg. Corp. (Lycoming)	GO-145-C2	A	4	HOpp	G	75	3200	S.L.	73	191.5	2.55	3.625x7.5	144.5	6.5	128.0	.....	.....[2]	20.59	29.31	.50[3]	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	.....	No	248	210
Aviation Mfg. Corp. (Lycoming)	GO-145-C3	A	4	HOpp	G	75	3200	S.L.	73	193.5	2.58	3.625x3.5	144.5	6.5	128.0	.....	.....[2]	22.59	29.31	.50[3]	.010	prr	Al,Ca[4]	ES	2M	Sc	Marvel	Ec	No	256	210
Continental Motors Corp.	W670-K	A	7	Rad	D	225	2175	.....	.....	.....	.....	5¼x4⅝	668.0	5.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	W670-K-1	A	7	Rad	D	230	2125	.....	.....	.....	.....	5¼x4⅝	668.0	5.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	W670-M	A	7	Rad	D	240	2200	.....	.....	.....	.....	5¼x4⅝	668.0	6.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	W670-M1	A	7	Rad	D	250	2200	.....	.....	.....	.....	5¼x4⅝	668.0	6.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	A50	A	4	Opp	D	50	1900	.....	.....	.....	.....	3⅞x3⅝	171.0	5.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	A65	A	4	Opp	D	65	2300	.....	.....	.....	.....	3⅞x3⅝	171.0	6.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	A75	A	4	Opp	D	75	2600	.....	.....	.....	.....	3⅞x3⅝	171.0	6.3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Continental Motors Corp.	A80	A	4	Opp	D	80	2700	.....	.....	.....	.....	3⅞x3⅝	171.0	7.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Guiberson Diesel Engine Co....	A-980	A	9	Rad	D	210	2000	S.L.	41	509	2.32	4 13/16x6	982.0	14.70	85	.....	19¼	46	34	.44	.025	prr	.....	.....	.....	.....	.....	Ec	.....	.....	.....
Guiberson Diesel Engine Co....	A-918	A	9	Rad	D	250	2050	S.L.	....	549	2.20	4¾x5¾	918.0	16.00	105	.....	19¼	49	35	.43	.025	prr	.....	.....	.....	.....	.....	Ec	.....	.....	.....
Guiberson Diesel Engine Co....	A-1020	A	9	Rad	D	320	2200	S.L.	....	620	1.94	5⅛x5½	1021.0	15.00	113	.....	20	47	36 7/16	.395	.020	prr	.....	.....	.....	.....	.....	Ec	.....	.....	.....
Jacobs Aircraft Engine Co....	L-4M	A	7	Rad	D	225	2000	S.L.	73	490[5]	2.17	5¼x5	757.0	5.38	118	.....	16½	43½	36 9/32	.55	.018	prr	Al,S	BG	2M	Sc	Sg	Ec	No	900	121
Jacobs Aircraft Engine Co....	L-4MB	A	7	Rad	D	225	2000	S.L.	73	494[5]	2.20	5¼x5	757.0	5.38	118	.....	16½	43½	36 9/32	.55	.018	prr	Al,S	BG	1M[6]	Sc	Sg	Ec	No	900	121
Jacobs Aircraft Engine Co....	L-4MA7	A	7	Rad	D	225	2000	S.L.	73	493[5]	2.19	5¼x5	757.0	5.38	118	.....	16½	43½	36⅝	.55	.018	prr	Al,S	BG	2M	Sc	Sg	Ec	No	900	121
Jacobs Aircraft Engine Co....	L-5M	A	7	Rad	D	285	2000	S.L.	73	521[5]	1.82	5½x5	831.0	6.00	136	.....	16½	43½	36 9/32	.53	.018	prr	Al,S	BG	2M	Sc	Sg	Ec	No	925	156
Jacobs Aircraft Engine Co....	L-5MB	A	7	Rad	D	285	2000	S.L.	73	525[5]	1.84	5½x5	831.0	6.00	136	.....	16½	43½	37 19/32	.53	.018	prr	Al,S	BG	1M[6]	Sc	Sg	Ec	No	925	156
Jacobs Aircraft Engine Co....	L-5MA7	A	7	Rad	D	285	2000	S.L.	73	527[5]	1.85	5½x5	831.0	6.00	136	.....	16½	43½	36⅝	.53	.018	prr	Al,S	BG	2M	Sc	Sg	Ec	No	925	156
Jacobs Aircraft Engine Co....	L-6M	A	7	Rad	D	300	2100	3700	80	550[5]	1.66	5½x5½	914.0	6.00	140	.....	16½	45⅜	37 29/32	.45	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	No	975	195
Jacobs Aircraft Engine Co....	L-6MB	A	7	Rad	D	300	2100	3700	80	550[5]	1.66	5½x5½	914.0	6.00	140	.....	16½	45⅜	37 29/32	.45	.025	prr	Al,S	BG	1M[6]	Sc	Sg	Ec	No	975	195
Jacobs Aircraft Engine Co....	L-6MA	A	7	Rad	D	300	2100	3700	80	550[5]	1.66	5½x5½	914.0	6.00	140	.....	16½	45⅜	38¾	.45	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	No	975	195
Kinner Motors, Inc.	K-5	A	5	Rad	D	100	1810	S.L.	73	275	2.75	4¼x5¼	372.0	5.10	118	.....	14	45⅜	32 5/16	.55	.025	prr	Al,S	BG	2M	B,Sc	Hy,Sg	Ec	Yes	550	3
Kinner Motors, Inc.	B-5	A	5	Rad	D	125	1925	S.L.	73	295	2.36	4⅝x5¼	441.0	5.25	117	.....	14	45⅜	32 5/16	.55	.025	prr	Al,S	BG	2M	B,Sc	Hy,Sg	Ec	Yes	570	51
Kinner Motors, Inc.	R-5-1	A	5	Rad	D	160	1975	S.L.	73	314	1.96	4⅞x5¼	490.0	5.00	130	.....	14	45⅜	32 5/16	.55	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	Yes	590	77
Kinner Motors, Inc.	R-5-II	A	5	Rad	D	160	1850	S.L.	73	330	2.05	5x5½	540.0	5.50	127	.....	14	45 1/16	32 5/16	.55	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	Yes	615	153
Kinner Motors, Inc.	C-5	A	5	Rad	D	210	1900	S.L.	73	420	2.00	5⅝x5¾	715.0	5.25	122	.....	19¼	50	36¼	.55	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	Yes	1000	62
Kinner Motors, Inc.	C-7	A	7	Rad	D	300	1800	S.L.	73	630	2.10	5⅝x6	1044.0	5.25	126	.....	20	48¼	45 13/32	.55	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	Yes	1160	122
Kinner Motors, Inc.	SC-7	A	7	Rad	D	350	1900	5000	73	650	1.85	5⅝x6	1044.0	5.25	148	9.33	20	47¾	45 13/32	.55	.025	prr	Al,S	BG	2M	Sc	Sg	Ec	Yes	1150	175
Lenape Aircraft Motors, Inc....	AR-3	A	3	Rad	D	50	2125	S.L.	73	150	3.00	4¼x4	160.0	5.00	120	.....	12½	34¼	23 15/16	.55	.009	prr	Al,S	BG	M	B	Sg	.....	No	340	74
Lenape Aircraft Motors, Inc....	AR-340	A	3	Rad	D	40	2050	S.L.	73	150	3.75	4¼x4	160.0	5.00	115	.....	12½	34¼	23 15/16	.55	.010	prr	Al,S	ES	M	B	Sg	.....	No	340	119
Lenape Aircraft Motors, Inc....	LM-3		3	Rad	D	52	2325	S.L.	73	138	.55	4¼x4	160.4	4.9:1	.....	.....	12½	36	24	.55	.....	prr	Al,S	ES	DM	ES	Sg	.....	No	250	203
Lenape Aircraft Motors, Inc....	LM-365		3	Rad	D	65	2350	S.L.	73	140	.55	4¼x4	167	5.8:1	.....	.....	12½	36	24	.55	.....	prr	Al,S	ES	DM	ES	Sg	.....	No	250	203
Lenape Aircraft Motors, Inc....	LM-375		3	Rad	D	75	2450	S.L.	73	142	.55	4¼x4	170.5	5.8:1	.....	.....	12½	36	24	.55	.....	prr	Al,S	ES	DM	ES	Sg	.....	No	250	215

Footnotes

A —Air cooled
Al —Aluminum
Apl —Applied for
B —Bosch
Bat —Battery ignition
Be —Berling
C —Cast iron
CG —Chandler-Groves
Ch —Champion

| | | |

1—3 Seats

Manufacturer	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)
						General					**Power Plant**						**Performance**		
Abrams Aircraft Corp.	*Explorer PC-4*			CML		*Wr.*	*420*	S.L.	*110*	*2,150*			*215*	*10,000*	*150*		*60*	*1,180*	*30,000*
Aeronautical Corp. of America	50-L	702	1,595	CML	2	Ly.	50	S.L.	12	250	3.5	70	95	S.L.	88	S.L.	35	500	13,000
Aeronautical Corp. of America	50-F	688	1,565	CML	2	Fr.	50	S.L.	12	250	3.5	72	95	S.L.	88	S.L.	35	500	13,000
Aeronautical Corp. of America	50-LA	702	1,635	CML	2	Ly.	50	S.L.	12	250	3.5	70	95	S.L.	88	S.L.	35	500	13,000
Aeronautical Corp. of America	65-LA	702	1,695	CML	2	Ly.	65	S.L.	12	250	4.0	70	102	S.L.	95	S.L.	35	600	14,000
Aeronautical Corp. of America	50-C	675	1,695	CML	2	Con.	50	S.L.	12	250	3.7	76	98	S.L.	92	S.L.	35	550	13,500
Aeronautical Corp. of America	65-C	675	1,795	CML	2	Con.	65	S.L.	12	250	4.3	76	105	S.L.	98	S.L.	35	650	15,000
Air Transport Mfg. Co., Ltd.	P-2	482		OML	2	K	100	S.L.	30	450	7.0	82	130	1,000	105	1,000	40	1,200	14,000
Air Transport Mfg. Co., Ltd.	P-2-S	488		OML	2	K	100	S.L.	30	450	7.0	82	135	1,000	110	1,000	42	1,200	14,000
Akron Aircraft, Inc.	Funk B	715	1,950	CML	2	Funk	63	S.L.	16	400	4.0	76	112	S.L.	100	S.L.	45	750	16,000
American Aircraft Company	*S-1B*		*2,995*	*CML*	2	*Se*	*125*	*S.L.*	*23.5*	*300*	*7.0*	*100*	*120*	*S.L.*	*100*	*S.L.*	*35*	*1,200*	*18,000*
Applegate Amphibians	*P. No. 1*		*2,500*	*A*	2	*Cont. 75*	*75*	*S.L.*	*33*	*500*	*5.0*	*76*	*102*	*S.L.*	*85*	*S.L.*	*45*	*450*	*11,000*
Bellanca	*14-9 Cruisair*			*CML*	3	*LeB*	*90*		*22*	*500*	*5.0*	*74*	*132*		*120*		*45*	*800*	*14,750*
Lawrence W. Brown Aircraft Co.	*B-3*		*8,500*	*CML*	2	*Men.*	*250*	*5,000*	*58*	*600*		*84*	*205*	*S.L.*	*190*	*S.L.*		*1,200*	*18,000*
Collier Aircraft Co., Inc., Wichita, Kans.	*Collier Ambassador, CA-1*			*B*	2	*Men.*	*125*	*0*	*45*	*700*	*7.0*		*133*	*1,000*	*125*	*1,000*	*47*	*900*	*16,000*
Culver Aircraft Corp.	GK	674	3,475	CLM[1]	2	LeB.	90	S.L.	25	550	5.4	80	135	S.L.	118	S.L.	40	850	14,850
Culver Aircraft Corp.	*GW*		*3,875*	*CLM*[1]	2	*WarRiRm*	*90*	*S.L.*	*25*	*550*	*5.4*	*80*	*135*	*S.L.*	*118*	*S.L.*	*40*	*900*	*15,700*
Culver Aircraft Corp.				*CLM*[1]	2	*WarRiRm*	*145*	*S.L.*	*35*	*600*	*9.0*	*84*	*170*	*S.L.*	*155*	*S.L.*	*45*	*1,200*	*20,000*
Engineering & Research Corp.	*Ercoupe 415*			*CLM*	2	*Erco*	*60*	*S.L.*	*14*	*350*	*3.6*	*66*	*106*	*S.L.*	*95*	*3,000*	*40*	*550*	*12,000*
Engineering & Research Corp.	*Ercoupe 415C*			*CLM*	2	*Con*	*65*	*S.L.*	*14*	*350*	*4.0*	*72*	*110*	*S.L.*	*100*	*3,000*	*40*	*600*	*14,000*
Fairchild Aircraft	*M-62*			*OML*	2	*Ran*	*175*	*S.L.*	*45*	*550*	*10.0*	*86*	*140*	*S.L.*	*120*	*S.L.*	*50*	*835*	*16,000*
Gwinn Aircar Co., Inc.	Aircar-1	682		CBL	2-3	Pob II	90	S.L.	25	525	5.0	84	120	S.L.	105	S.L.	[2]41		
Gwin Aircar Co., Inc.	*Aircar-2*			*CBL*	2-3	*Pob V*	*130*	*S.L.*	*25*	*500*	*6.0*	*84*	*137*	*S.L.*	*120*	*S.L.*	[2]*41*		
Harlow Aircraft Co.	Trainer PJC-1	659		CLM	2	War	145	S.L.	34	600	9.0	84	165	S.L.	160	Max.	55	800	16,500
Johansen Aircraft	*JA-2*		*1,350*	*CML*	2	*Con.*	*40*	*S.L.*	*10*	*250*	*3.0*	*69*	*96*	*S.L.*	*85*	*S.L.*	*39*	*450*	*12,500*
Kellett Autogiro Corp.	KD-1B	712		CLGY	1	Ja	225	S.L.	30	208	14.0	102	127	S.L.	102	S.L.	No	1,060	14,000
Kellett-Autogiro Corp.	KD-1	712		OLGY	2	Ja	225	S.L.	30	205	14.0	102	125	S.L.	100	S.L.	No	1,060	14,000
Luscombe Airp. Corp.	8	694		CML	2	Con.	50	S.L.	15	400	3.75	76	109	S.L.	96	S.L.	37	750	13,500
Luscombe Airp. Corp.	8-A	694		CML	2	Con.	65	S.L.	15	350		76	115	S.L.	104	S.L.	37	900	15,000
Luscombe Airp. Corp.	8-A Seaplane	694		CMS	2	Con.	65	S.L.	15	350		76	102	S.L.	95	S.L.	40	650	10,000
Miller Aircraft Corp.	*Z-1*			*OCLM*	2	*Men. B-4*	*95*	*S.L.*	*30*	*555*	*6.0*	*67*	*125*	*S.L.*	*110*	*S.L.*	*45*	*750*	*12,000*
Miller Aircraft Corp.	*Z-2*			*OCLM*	2	*Men. C-4*	*125*	*S.L.*	*36*	*590*	*7.8*	*67*	*155*	*S.L.*	*132*	*S.L.*	*46*	*975*	*15,000*
Miller Aircraft Corp.	*Z-3*			*OCLM*	2	*Men. C-4B*	*150*	*S.L.*	*40*	*600*	*9.3*	*67*	*165*	*S.L.*	*145*	*S.L.*	*46*	*1,130*	*18,000*
Monocoupe Corp.	*Deluxe 90-W*		*4,950*	*CML*	2	*War*	*125*	*S.L.*	*28*	*580*	*6.3*	*78*	*150*	*S.L.*	*130*	*6,000*	*40*	*1,300*	*19,000*
Monocoupe Corp.	Deluxe 90-A	306	4,175	CML	2	Lam	90	S.L.	28	600	4.8	78	130	S.L.	110	S.L.	40	900	15,000
Monocoupe Corp.	110-Special	327	5,600	CML	2	War	145	S.L.	28	530	8.5	78	186	S.L.	162	S.L.	55	2,100	23,800
Naugle Aircraft Co.	*1050*		*Under 1,600*	*CLM*	2	*Ly.*	*75*	*S.L.*	*14*	*430*	*4.65*	*65*	*156*	*S.L.*	*142*	*S.L.*	[3]*35*	[3]*950*	*20,000*
North American Aviation, Inc.	*NA-35*			*CML*	2	*Men.Id.*	*150*	*3,000*	*24*	*305*	*9.75*	*80*	*140*	*3,000*	*124*	*3,000*	*48*	*900*	*18,500*
North American Aviation, Inc.	*NA-35*			*CML*	2	*Ran.Id.*	*175*	*S.L.*	*27*	*315*	*11.48*	*84*	*150*	*S.L.*	*135*	*3,000*	*50*	*1,350*	*19,500*
Pasped Aircraft Corp.	*Skylark W-1*			*OCML*	2	*War.*	*125*	*S.L.*	*31*	*545*	*6.0*	*96*	*139*	*S.L.*	*117*	*S.L.*	*35*	*800*	*19,000*
Phillips Aviation Co.	1-B	693	5,800	CML	2	Men.	125	S.L.	43	720	8.5	84	140	S.L.	130	8,000	49	710	15,500
Phillips Aviation Co.	*CT-1*[11]		*3,500*	*CBL*	2	*Men.*	*95*	*S.L.*	*26*	*400*	*6.4*	*94*	*117*	*S.L.*	*102*	*5,000*	*41*	*960*	*16,000*
Phillips Aviation Co.	*CT-1*		*8,800*	*CBL*	2	*Phillips*	*120*	*S.L.*	*22*				*127*	*S.L.*	*110*	*5,000*	*41*	*960*	*18,000*
Piper Aircraft Corp.[12, 13, 14]	J-3 Cub Trainer	*660	995	CML	2	A-40-4,5 (Con. A-40)	40	S.L.	9	200	3.0	69	85	S.L.	70	S.L.	38	400	10,000
Piper Aircraft Corp.[13, 14]	J-3C-65 Cub Trainer	*691	1,598	CML	2	A-65-B Con. A-65	65	S.L.	12	240	4.0	72	90	S.L.	85	S.L.	39	675	12,000
Piper Aircraft Corp.[13, 14]	J-3C-50 Cub Trainer	*691	1,368	CML	2	(50-1 or 3) (Con. A-50)	50	S.L.	12	250	3.6	76	91	S.L.	80	S.L.	40	650	12,000
Piper Aircraft Corp.[13, 14]	J3F-50 Cub Trainer	*692	1,298	CML	2	Fr.AC-1-50	50	S.L.	12	260	3.5	70	89	S.L.	79	S.L.	40	600	12,000
Piper Aircraft Corp.[13, 14]	J3L Cub Trainer	*698	1,298	CML	2	Ly. O-145	50	S.L.	12	260	3.5	70		S.L.		S.L.	40		12,000
Piper Aircraft Corp.[13, 14]	J4 Cub Coupe	*703	1,995	CML	2	(Series 7, 8) Con. A-65	65	S.L.	16	382	4.0	72	100	S.L.	87	S.L.	41	650	12,000
Piper Aircraft Corp. 4, 2	*J4 Cub Coupe*		*1,910*	*CML*	2	*Ly. 0-145*	*65*	*S.L.*	*16*	*382*	*4.0*	*70*	*100*	*S.L.*	*87*	*S.L.*	*41*	*600*	*12,000*
Piper Aircraft Corp. 4, 2	*J5 Cub Cruiser*		*1,798*	*CML*	3	*A-75 Con.*	*75*	*S.L.*	*18*	*320*	*4.6*	*72*	*100*	*S.L.*	*87*	*S.L.*	*42*	*450*	*10,000*
Porterfield Aircraft Corp.	50	690	1,495	CML	2	Con.	50	S.L.	11	260	[3]3.75	76	102	S.L.	91	S.L.	32	460	12,000
Porterfield Aircraft Corp.	*55*		*1,560*	*CML*	2	*Con.*	*50*	*S.L.*	*14*	*320*	*4.0*	*76*	*104*	*S.L.*	*93*	*S.L.*	*33*	*490*	*13,000*
Porterfield Aircraft Corp.	*65*		*1,775*	*CML*	2	*Con.*	*65*	*S.L.*	*14*	*290*	*4.75*	*75*	*111*	*S.L.*	*100*	*S.L.*	*33*	*670*	*16,000*
Porterfield Aircraft Corp.	*75*			*CML*	2	*Ly.*	*75*	*S.L.*	*18*	*350*	*5.5*	*80*	*120*	*S.L.*	*108*	*S.L.*	*38*	*750*	*17,000*
Porterfield Aircraft Corp.	90	611		CML	2	War.	90	S.L.	18	330	6.5	80	133	S.L.	120	S.L.	40	1,050	20,000
Porterfield Aircraft Corp.	*145*			*OBL*	2	*War.*	*90*	*S.L.*	*32*	*400*	*9.0*	*86*	*125*	*S.L.*	*113*	*S.L.*	*32*	*900*	*16,000*
Rearwin Aircraft & Engines, Inc.	Sportster-7000	*574	2,795	CML	2	K-R	70	S.L.	24	500	4.8	76	115	800	103	800	38	670	13,000
Rearwin Aircraft & Engines, Inc.	Sportster-9000KR	*591	3,295	CML	2	K-R	90	S.L.	24	500	5.0	76	125	800	112	800	38	1,000	15,000
Rearwin Aircraft & Engines, Inc.	Sportster-9000	*624	On req.	CML	2	War.	90	S.L.	24	450	5.7	76	123	800	110	800	38	1,000	15,000
Rearwin Aircraft & Engines, Inc.	Speedster-6000M	661	4,495	CML	2	Men.	125	S.L.	34	575	8.0	76	150	800	130	800	48	1,300	18,000
Rearwin Aircraft & Engines, Inc.	Cloudster-8090	711	3,795	CML	2	K-R	90	S.L.	34	650	5.0		125	800	110	800	48	750	14,000
Rearwin Aircraft & Engines, Inc.	Cloudster-8125	711	4,295	CML	2	K-R	120	S.L.	34	625	7.0		145	800	125	800	48	1,000	17,000
Rearwin Aircraft & Engines, Inc.	*Cloudster-8130*			*CML*	3	*K-R*	*90*	*S.L.*	*34*	*625*	*5.0*		*125*	*800*	*110*	*800*	*50*	*650*	*13,000*
Rearwin Aircraft & Engines, Inc.	*Cloudster-8135*			*CML*	3	*K-R*	*120*	*S.L.*	*34*	*600*	*7.0*		*145*	*800*	*125*	*800*	*50*	*900*	*15,000*
Rearwin Aircraft & Engines, Inc.	*Model 165*			*CML*	2	*Con.*	*65*	*S.L.*	*18*	*496*	*3.65*		*105*		*98*		*40*	*600*	*12,000*
Rearwin Aircraft & Engines, Inc.	*Model 175*			*CML*	2	*Con.*	*75*	*S.L.*	*18*	*404*	*4.45*		*115*		*105*		*40*	*750*	*14,000*
Orrin E. Ross	*RS-1*			*OML*	2	*Con.*	*40*		*9*	*240*	*2.8*	*69*	*90*		*75*		*40*		*9,000*
Ryan Aeronautical Co.	S-C	658		CML	3	War.	145	S.L.	37	525	9.5	82	150	S.L.	135	8,500	45	900	17,200
Ryan Aeronautical Co.	ST-A	571		OML	2	Men.	125	S.L.	24	366	8.0	80	126	S.L.	115	3,000	42	800	16,000
Ryan Aeronautical Co.	ST-A Special	681		OML	2	Men.	150	3,000	24	326	10.0	80	142	3,000	128	3,000	42	975	16,600
Stearman-Hammond Aircraft Corp.	Y-1S	644	7,150	CML	2	Men.	150	3,000	43	570	8.5	80	125	3,000	113	3,000	39	725	17,000
Stinson Aircraft Div.	*105*			*CML*	3	*Con.*	*75*	*S.L.*	*20*	*405*	*5.0*	*70*			*107.5*	*4,600*	*43*	*430*	*9,100*
Stinson Aircraft Div.	*105*			*CML*	3	*Con.*	*80*	*S.L.*	*20*	*405*	*5.0*	*70*			*111*	*4,800*	*43*	*485*	*12,100*
Taylorcraft Aviation Corp.	BC-65	*700	1,835	CML	2	Con.	65	S.L.	12	250	3.75		105	S.L.	95	S.L.	38	640	15,000
Taylorcraft Aviation Corp.	BL-65	*696	1,775	CML	2	Ly.	65	S.L.	12	250	3.75		105	S.L.	95	S.L.	38	640	15,000
Taylorcraft Aviation Corp.	BF-60	*699	1,795	CML	2	Fr.	60	S.L.	12	250	3.75		105	S.L.	95	S.L.	38	640	15,000
Taylorcraft Aviation Corp.	BL	*700	1,660	CML	2	Ly.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000
Taylorcraft Aviation Corp.	BC	*696	1,730	CML	2	Con.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000
Taylorcraft Aviation Corp.	BF	*699	1,685	CML	2	Fr.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000
Taylorcraft Aviation Corp.	BL-T (Trainer)	*700	1,495	CML	2	Ly.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000
Waco Aircraft Co.	UPF-7	642		OBL	2	Con.Ri.	220	S.L.	50	[10]402	12.5		126	S.L.	100	S.L.	51	849	14,300
Waco Aircraft Co.	YPF-7	586		OBL	2	Ja.Ri.	225	S.L.	50	[10]440	12.4		130	S.L.	110	S.L.	51	921	15,000
Waco Aircraft Co.	*LPF-7*			*OBL*	2	*Ly.Ri.*	*220*	*S.L.*	*50*	[10]*320*	*12.5*		*125*	*S.L.*	*105*	*S.L.*	*51*	*868*	*14,600*
Welch Aire. Industries, Inc.	OW5M	637	996	CML	2	Con.	40	S.L.	9	250	3.0	66	93	S.L.	85	S.L.	32	460	12,000
Welch Aire. Industries, Inc.	OW6M	636	996	CML	2	Aer.	36	S.L.	9	250	3.0	66	93	S.L.	85	S.L.	31	475	12,500
Welch Aire. Industries, Inc.	*OW7M*		*996*	*CML*	2	*Welch 0-2*	*45*	*S.L.*	*9*	*250*	*3.1*	*70*	*96*	*S.L.*	*88*	*S.L.*	*29*	*550*	*13,500*
Welch Aire. Industries, Inc.	*OW8M*		*1195*	*CML*	2	*Franklin*	*50*	*S.L.*	*10*	*290*	*3.5*	*72*	*100*	*S.L.*	*90*	*S.L.*	*32*	*630*	*14,000*
Welch Aire. Industries, Inc.	*OW5M Trainer*		*890*	*CML*	2	*Con.*	*40*		*9*	*250*	*3.0*	*69*	*93*	*S.L.*	*85*	*S.L.*	*32*	*960*	*12,000*
Wendt Aircraft Corp.	*Swift W-2*		*3,175*	*2pcml*	2	*LeB5F*	*90*	*S.L.*	*25*	*500*	*5.0*	*78*	*132*		*125*	*2,500*	*40*	*1,000*	*16,000*
White Aircraft Corp.	*P.T.-7*			*OLB*	2	*War.*	*165*		*36*	*332.5*			*115*		*95*		*40*	*1,000*	

l Aircra

not assume responsibil

rmance				We	
At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)
....	60	1,180	30,000	.....	.....
.	35	500	13,000	6.8	23.0
	35	500	13,000	6.8	23.0
	35	500	13,000	6.8	23.0
	35	600	14,000	6.8	17.7
	35	550	13,500	6.8	23.0
	35	650	15,000	6.8	17.7
,000	40	1,200	14,000	10.12	16.5
,000	42	1,200	14,000	10.73	17.5
	45	750	16,000	8.0	21.7
	35	1,200	18,000	6.75	14.2
	45	450	11,000	8.63	15.0
...	45	800	14,750	11.75	18.3
	.....	1,200	18,000	17.6	10.6
000	47	900	16,000	11.13	15.5
	40	850	14,850	10.7	17.2
	40	900	15,700	10.7	17.2
	45	1,200	20,000	12.6	12.6
000	40	550	12,000	7.9	18.7
000	40	600	14,000	7.8	17.3
	50	835	16,000	12.25	14.0
	‡ 41	.....	.....	10.0	18.9
	‡ 41	.....	.....	10.0	13.1
	55	800	16,500	12.17	15.5
	39	450	12,500	6.48	30.0
	No	1,060	14,000	40.8	10.0
	No	1,060	14,000	40.6	9.98
	37	750	13,500	8.6	24.0
	37	900	15,000	8.6	18.5
	40	650	10,000	9.0	19.4
	45	750	12,000	11.25	16.6
	46	975	13,000	11.4	12.8
	46	1,130	12,000	11.8	11.0
00	40	1,300	19,000	12.2	17.9
	40	900	15,000	12.2	17.9
	55	2,100	25,800	17.4	11.3
	‡ 35	‡ 950	20,000	8.4	14.0
00	48	900	18,500	11.89	11.73
00	50	1,350	19,500	12.70	10.75
	35	800	19,000	10.0	15.2
00	49	710	13,500	13.0	17.6
00	41	960	16,000	.....	.....
00	41	960	18,000	12.03	12.8
	38	400	10,000	5.6	25.0
	39	675	12,000	6.18	17.0
	40	650	12,000	6.18	22.0
	40	600	12,000	6.18	22.0
	40	.....	12,000	6.18	22.0
	41	650	12,000	7.1	20.0
	41	600	12,000	7.1	20.0
	42	450	10,000	8.1	19.4
	32	460	12,000	6.6	22.2
	33	490	13,000	6.9	21.1
	33	670	16,000	6.9	17.9
	38	750	17,000	9.0	17.6
	40	1,050	28,000	9.0	14.7
	32	900	16,000	7.0	13.4
0	38	670	13,000	8.8	20.8
0	38	1,000	15,000	8.8	16.2
0	38	1,000	15,000	8.8	16.2
0	48	1,300	18,000	11.88	13.6
0	48	750	14,000	10.11	18.15
0	48	1,000	17,000	10.73	14.45
0	50	650	13,000	11.12	20.0
0	50	900	15,000	11.12	15.0
	40	600	12,000	8.2	20.77
	40	750	14,000	8.2	18.0
	40	.....	9,000	6.4	23.5
	45	900	17,200	10.7	14.8
	42	800	16,000	12.9	12.8
	42	975	18,600	12.9	10.7
	39	725	17,000	10.7	15.0
	43	430	9,100	10.2	21.1
	43	485	12,100	10.2	19.7
	38	640	15,000	6.8	17.7
	38	640	15,000	6.8	17.7
	38	640	15,000	6.8	19.1
	38	450	13,000	6.8	23.0
	38	450	13,000	6.8	23.0
	38	450	13,000	6.8	23.0
	38	450	13,000	6.8	23.0
	51	849	14,300	10.85	12.06
	51	921	15,000	10.85	11.80
	51	868	14,600	10.85	12.06
	32	460	12,000	6.6	25.7
	31	475	12,500	6.7	26.0
	29	550	13,500	5.99	20.0
	32	630	14,000	6.6	19.0
	32	960	12,000	6.6	25.7
	40	1,000	16,000	10.0	15.5
	40	1,000	.....	9.27	13.6

Aviation's Civil Aircraft Specificatio

AVIATION does not assume responsibility for the figures given

1–3 Seats

Manufacturer	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder
rams Aircraft Corp	*Explorer PC-4*			*CML*		*Wr.*	*420*	*S.L.*	*110*	*2,150*			*215*	*10,000*	*150*		*60*	*1,180*	*30,000*			*2,350*	*4,000*	*38'6"*	*27'9"*	*6'7"*	*258*			
ronautical Corp. of America	50-L	702	1,595	CML	2	Ly.	50	S.L.	12	250	3.5	70	95	S.L.	88	S.L.	35	500	13,000	6.8	23.0	670	1,150	36'	20'8"	9'	169	19.8	6.5	8.2
ronautical Corp. of America	50-F	688	1,565	CML	2	Fr.	50	S.L.	12	250	3.5	72	95	S.L.	88	S.L.	35	500	13,000	6.8	23.0	670	1,150	36'	21'	9'	169	19.8	6.5	8.2
ronautical Corp. of America	50-LA	702	1,635	CML	2	Ly.	50	S.L.	12	250	3.5	70	95	S.L.	88	S.L.	35	500	13,000	6.8	23.0	675	1,150	36'	20'10"	9'	169	19.8	6.5	8.2
ronautical Corp. of America	65-LA	702	1,695	CML	2	Ly.	65	S.L.	12	250	4.0	70	102	S.L.	95	S.L.	35	600	14,000	6.8	17.7	675	1,150	36'	20'10"	9'	169	19.8	6.5	8.2
ronautical Corp. of America	50-C	675	1,695	CML	2	Con.	50	S.L.	12	250	3.7	76	98	S.L.	92	S.L.	35	550	13,500	6.8	23.0	675	1,150	36'	21'1"	9'	169	19.8	6.5	8.2
ronautical Corp. of America	65-C	675	1,795	CML	2	Con.	65	S.L.	12	250	4.3	76	105	S.L.	98	S.L.	35	650	15,000	6.8	17.7	675	1,150	36'	21'1"	9'	169	19.8	6.5	8.2
Transport Mfg. Co., Ltd.	P-2	482		OML	2	K	100	S.L.	30	450	7.0	82	130	1,000	105	1,000	40	1,200	14,000	10.12	16.5	1,020	1,650	32'	24'	7'	163.0	16.2	2.5	7.0
Transport Mfg. Co., Ltd.	P-2-S	488		OML	2	K	100	S.L.	30	450	7.0	82	135	1,000	110	1,000	42	1,200	14,000	10.73	17.5	1,075	1,750	32'	24'	7'	163.0	16.2	2.5	7.0
ron Aircraft, Inc	Funk B	715	1,950	CML	2	Funk	63	S.L.	16	400	4.0	76	112	S.L.	100	S.L.	45	750	16,000	8.0	21.75	870	1,350	35'	20'	6'	169.0	23.0	5.28	6.16
erican Aircraft Company	*S-1B*		2,995	*CML*	2	*Se*	*125*	*S.L.*	*23.5*	*300*	*7.0*	*100*	*120*	*S.L.*	*100*	*S.L.*	*35*	*1,200*	*18,000*	*6.75*	*14.2*	*1,250*	*1,900*	*40'*	*23'10"*	*7'0"*	*240.0*			
plegale Amphibians	*P. No. 1*		2,500	*A*	2	*Cont. 75*	*75*	*S.L.*	*33*	*500*	*5.0*	*76*	*102*	*S.L.*	*85*	*S.L.*	*45*	*450*	*11,000*	*8.63*	*15.0*	*850*	*1,500*	*34'6"*	*25'*	*8'*	*173.8*	*19.2*	*4.66*	*6.76*
lanca	*14-9 Cruisair*			*CML*	3	*LeB*	*90*		*22*	*500*	*5.0*	*74*	*132*		*120*		*45*	*800*	*14,750*	*11.75*	*18.3*	*943*	*1,650*	*34'2"*	*21'3"*	*6'3"*	*140.0*	*14.0*	*6.5*	*5.8*
erence W. Brown Aircraft Co	*B-3*		8,500	*CML*	2	*Men.*	*250*	*5,000*	*58*	*600*		*84*	*205*	*S.L.*	*190*	*S.L.*		*1,200*	*18,000*	*17.6*	*10.60*	*1,850*	*2,650*	*32'*	*26'*	*8'*	*150.0*			
lier Aircraft Co., Inc., Wichita, Kans.	*Collier Ambassador, CA-1*			*B*	2	*Men.*	*125*	*0*	*45*	*700*	*7.0*		*133*	*1,000*	*125*	*1,000*	*47*	*900*	*16,000*	*11.13*	*15.5*	*1,198*	*1,950*	*Upr.28'1" Lwr.28'6"*	*23'*	*7'6"*	*175.0*	*13.65*	*3.60*	*6.10*
ver Aircraft Corp	GK	674	3,475	CLM[1]	2	LeB.	90	S.L.	25	550	5.4	80	135	S.L.	118	S.L.	40	850	14,850	10.7	17.2	940	1,550	29'7"	18'7"	6'	145.0	18.8	4.85	5.87
ner Aircraft Corp	*GW*		3,875	*CLM[1]*	2	*WarRiRm*	*90*	*S.L.*	*25*	*550*	*5.4*	*80*	*135*	*S.L.*	*118*	*S.L.*	*40*	*900*	*15,700*	*10.7*	*17.2*	*950*	*1,550*	*29'7"*	*18'8"*	*6'*	*145.0*	*18.8*	*4.85*	*5.87*
ner Aircraft Corp				*CLM[1]*	2	*WarRiRm*	*145*	*S.L.*	*35*	*600*	*9.0*	*84*	*170*	*S.L.*	*155*	*S.L.*	*45*	*1,200*	*20,000*	*12.6*	*12.6*	*1,057*	*1,820*	*29'7"*	*18'8½"*	*6'3"*	*145.0*	*18.8*	*4.85*	*5.87*
ineering & Research Corp	*Ercoupe 415*			*CLM*	2	*Erco*	*60*	*S.L.*	*14*	*350*	*3.6*	*66*	*106*	*S.L.*	*95*	*3,000*	*40*	*550*	*12,000*	*7.9*	*18.7*	*680*	*1,125*	*30'*	*20'9"*	*5'11"*	*142.6*	*16.8*	*3.3*	*6.0*
ineering & Research Corp	*Ercoupe 415C*			*CLM*	2	*Con*	*65*	*S.L.*	*14*	*350*	*4.0*	*72*	*110*	*S.L.*	*100*	*3,000*	*40*	*600*	*14,000*	*7.8*	*17.3*	*690*	*1,125*	*30'*	*20'*	*5'11"*	*142.6*	*16.8*	*3.3*	*6.0*
rchild Aircraft	*M-62*			*OML*	2	*Ran*	*175*	*S.L.*	*45*	*550*	*10.0*	*86*	*140*	*S.L.*	*120*	*S.L.*	*50*	*835*	*16,000*	*12.25*	*14.0*	*1,749*	*2,450*	*36'*	*27'8"*	*7'9"*	*200.0*	*16.6*	*6.9*	*14.5*
inn Aircar Co., Inc	Aircar-1	682		CBL	2-3	Pob II	90	S.L.	25	525	5.0	84	120	S.L.	105	S.L.	*41			10.0	18.9	1,090	1,700	24'	16'3"	6'10"	169.4	17.4		None
n Aircar Co., Inc.	*Aircar-2*			*CBL*	*2-3*	*PobV*	*130*	*S.L.*	*25*	*500*	*6.0*	*84*	*137*	*S.L.*	*120*	*S.L.*	*41			*10.0*	*13.1*	*1,090*	*1,700*	*24'*	*16'3"*	*6'10"*	*169.4*	*17.4*		*None*
low Aircraft Co	Trainer PJC-1	659		CLM	2	War	145	S.L.	34	600	9.0	84	165	S.L.	160	Max.	55	800	16,500	12.17	15.54	1,521	2,251	35'9¾"	23'4"	7'3"	185.0	13.02	12.58	10.9
nsen Aircraft	*JA-2*		1,350	*CML*	2	*Con.*	*40*	*S.L.*	*10*	*250*	*3.0*	*69*	*96*	*S.L.*	*85*	*S.L.*	*39*	*450*	*12,500*	*6.48*	*30.0*	*700*	*1,200*	*36'*	*21'9"*	*6'7"*	*185.0*	*16.0*	*5.0*	*5.0*
lett Autogiro Corp	KD-1B	712		CLGY	1	Ja	225	S.L.	30	208	14.0	102	127	S.L.	102	S.L.	No	1,060	14,000	40.8	10.0	1,630	2,250	40'	28'10"	10'3"	55.2[4]		12.0	3.2
lett-Autogiro Corp	KD-1	712		OLGY	2	Ja	225	S.L.	30	205	14.0	102	125	S.L.	100	S.L.	No	1,060	14,000	40.6	9.98	1,600	2,245	40'	28'10"	10'3"	55.2[4]		12.0	3.2
combe Airp. Corp	8	694		CML	2	Con.	50	S.L.	15	400	3.75	76	109	S.L.	96	S.L.	37	750	13,500	8.6	24.0	640	1,200	35'	20'	5'10½"	140.0	13.6	4.9	5.65
combe Airp. Corp	8-A	694		CML	2	Con.	65	S.L.	15	350		76	115	S.L.	104	S.L.	37	900	15,000	8.6	18.5	650	1,200	35'	20'	5'10½"	140.0	13.0	4.9	5.65
combe Airp. Corp	8-A Seaplane	694		CMS	2	Con.	65	S.L.	15	350		76	102	S.L.	95	S.L.	40	650	10,000	9.0	19.4	791	1,260	35'	21'4"	8'	140.0	13.0	4.9	5.65
er Aircraft Corp	*Z-1*			*OCLM*	2	*Men. B-4*	*95*	*S.L.*	*30*	*555*	*6.0*	*67*	*125*	*S.L.*	*110*	*S.L.*	*45*	*750*	*12,000*	*11.25*	*16.6*	*1,020*	*1,700*	*30'*	*21'8"*	*6'8"*	*140.0*	*10.6*	*4.3*	*6.5*
er Aircraft Corp	*Z-2*			*OCLM*	2	*Men. C-4*	*125*	*S.L.*	*36*	*590*	*7.8*	*67*	*155*	*S.L.*	*132*	*S.L.*	*46*	*975*	*15,000*	*11.4*	*12.8*	*1,030*	*1,700*	*30'*	*21'8"*	*6'8"*	*140.0*	*10.6*	*4.3*	*6.5*
er Aircraft Corp	*Z-3*			*OCLM*	2	*Men. C-4S*	*150*	*S.L.*	*40*	*600*	*9.3*	*67*	*165*	*S.L.*	*145*	*S.L.*	*46*	*1,130*	*18,000*	*11.8*	*11.0*	*1,100*	*1,700*	*30'*	*21'8"*	*6'8"*	*140.0*	*10.6*	*4.3*	*6.5*
ocoupe Corp	*Deluxe 90-W*		4,950	*CML*	2	*War*	*125*	*S.L.*	*28*	*580*	*6.3*	*78*	*150*	*S.L.*	*130*	*6,000*	*40*	*1,300*	*19,000*	*12.2*	*17.9*	*1,020*	*1,616*	*32'*	*20'6"*	*6'11"*	*132.2*	*13.5*	*4.1*	*5.8*
ocoupe Corp	Deluxe 90-A	306	4,175	CML	2	Lam	90	S.L.	28	600	4.8	78	130	S.L.	110	S.L.	40	900	15,000	12.2	17.9	973	1,610	32'	20'6"	6'11"	132.2	13.5	4.1	5.8
ocoupe Corp	110-Special	327	5,600	CML	2	War	145	S.L.	28	530	8.5	78	186	S.L.	162	S.L.	55	2,100	23,800	17.4	11.3	1,045	1,630	23'2½"	20'5"	6'6"	94.0	16.0	3.5	5.0
gle Aircraft Co	*1050*		Under 1,600	*CLM*	2	*Ly.*	*75*	*S L*	*14*	*430*	*4.65*	*65*	*156*	*S.L.*	*142*	*S.L.*	*35	*950	*20,000*	*8.4*	*14.0*	*530*	*1,050*	*30'*	*18'7½"*	*6'11"*	*125.0*	*14.0*	*5.1*	*6.8*
th American Aviation, Inc.	*NA-35*			*CML*	2	*Men.Id.*	*150*	*3,000*	*24*	*305*	*9.75*	*80*	*140*	*3,000*	*124*	*3,000*	*48*	*900*	*18,500*	*11.89*	*11.73*	*1,218*	*1,760*	*29'8⅞"*	*25'6"*	*9'4"*	*148.0*	*12.40*	*5.0*	*8.0*
th American Aviation, Inc.	*NA-35*			*CML*	2	*Ran.Id.*	*175*	*S.L.*	*27*	*315*	*11.48*	*84*	*150*	*S.L.*	*135*	*3,000*	*50*	*1,350*	*19,500*	*12.70*	*10.75*	*1,319*	*1,880*	*29'8⅞"*	*25'10½"*	*9'4"*	*148.0*	*12.40*	*5.0*	*8.0*
ped Aircraft Corp	*Skylark W-1*			*OCML*	2	*War.*	*125*	*S.L.*	*31*	*545*	*6.0*	*96*	*139*	*S.L.*	*117*	*S.L.*	*35*	*800*	*19,000*	*10.0*	*15.2*	*1,300*	*1,900*	*35'10"*	*25'*	*7'8"*	*187.0*	*19.6*	*7.6*	*7.2*
ips Aviation Co	1-B	693	5,800	CML	2	Men.	125	S.L.	43	720	8.5	84	140	S.L.	130	8,000	49	710	13,500	13.0	17.6	1,475	2,170	32'6"	24'	7'8"	168.0			
ips Aviation Co	*CT-1*[11]		3,500	*CBL*	2	*Men.*	*95*	*S.L.*	*26*	*400*	*6.4*	*94*	*117*	*S.L.*	*102*	*5,000*	*41*	*960*	*16,000*			*941.5*	*1,604*	*28'3"* *27'1"*	*23'*	*8'3"*	*95.8* *89.8*	*Upper* *Lower*		
ips Aviation Co	*CT-1*		3,800	*CBL*	2	*Phillips*	*120*	*S.L.*	*22*				*127*	*S.L*	*110*	*5,000*	*41*	*960*	*18,000*	*12.03*	*12.8*	*1,037*	*1,600*	*28'3"*	*23'*	*7'8"*	*101.8* *97.4*	*12.7*	*4.3*	*7.4*
Aircraft Corp.[13, 13, 14]	J-3 Cub Trainer	*660	995	CML	2	A-40-4,5 (Con. A-40)	40	S L.	9	200	3.0	69	85	S.L.	70	S.L.	38	400	10,000	5.6	25.0	574	1,000	35'2½"	22'5"	6'8"	178.5	19.2	4.02	6.55
Aircraft Corp.[13, 14]	J-3C-65 Cub Trainer	*691	1,598	CML	2	A-65-B Con. A-65	65	S.L.	12	240	4.0	72	90	S.L.	85	S.L.	39	675	12,000	6.18	17.0	600	1,100	35'2½"	22'6½"	6'8"	178.5	19.2	4.02	6.55
Aircraft Corp.[13, 14]	J-3C-50 Cub Trainer	*691	1,368	CML	2	(50-1 or 3) (Con. A-50)	50	S.L.	12	250	3.6	76	91	S.L.	80	S.L.	40	650	12,000	6.18	22.0	600	1,100	35'2½"	22'6½"	6'8"	178.5	19.2	4.02	6.55
Aircraft Corp.[13, 14]	J3F-50 Cub Trainer	*692	1,298	CML	2	Fr.AC-1-50	50	S.L.	12	260	3.5	70	89	S.L.	79	S.L.	40	600	12,000	6.18	22.0	590	1,100	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55
Aircraft Corp.[13, 14]	J3L Cub Trainer	*698	1,298	CML	2	Ly. O-145	50	S.L.	12	260	3.5	70		S.L.		S.L.	40		12,000	6.18	22.0	590	1,100	35'2½"	22'3"	6'8"	178.5	19.2	4.02	6.55
Aircraft Corp.[13, 14]	J4 Cub Coupe	*703	1,995	CML	2	(Series 7, 8) Con. A-65	65	S.L.	16	382	4.0	72	100	S.L.	87	S.L.	41	650	12,000	7.1	20.0	800	1,301	36'2"	22'6"	6'10"	183.0	19.2	4.66	6.76
Aircraft Corp. 4, 2	*J4 Cub Coupe*		*1,910*	*CML*	2	*Ly. 0-145*	*65*	*S.L.*	*16*	*382*	*4.0*	*70*	*100*	*S.L.*	*87*	*S.L.*	*41*	*600*	*12,000*	*7.1*	*20.0*	*800*	*1,301*	*36'2"*	*22'6"*	*6'10"*	*183.0*	*19.2*	*4.66*	*6.76*
Aircraft Corp. 4, 2	*J5 Cub Cruiser*		*1,798*	*CML*	3	*A-75 Con.*	*75*	*S.L.*	*18*	*320*	*4.6*	*72*	*100*	*S.L.*	*87*	*S.L.*	*42*	*450*	*10,000*	*8.1*	*19.4*	*750*	*1,450*	*35'5½"*	*22'6"*	*6'10"*	*179.0*	*19.2*	*4.02*	*6.76*
rfield Aircraft Corp	50	690	1,495	CML	2	Con.	50	S.L.	11	260	[3.75	76	102	S.L.	91	S.L.	32	460	12,000	6.6	22.2	664	1,108	34'9"	22'5⅛"	7'	168.8	19.10	6.38	6.84
rfield Aircraft Corp	*55*		*1,560*	*CML*	2	*Con.*	*50*	*S.L.*	*14*	*320*	*4.0*	*76*	*104*	*S.L.*	*93*	*S.L.*	*33*	*490*	*13,000*	*6.9*	*21.1*	*675*	*1,160*	*34'9"*	*22'7⅛"*	*7'*	*168.8*	*19.10*	*6.38*	*6.84*
rfield Aircraft Corp	*65*		*1,775*	*CML*	2	*Con.*	*65*	*S.L.*	*14*	*290*	*4.75*	*75*	*111*	*S.L.*	*100*	*S.L.*	*33*	*670*	*16,000*	*6.9*	*17.9*	*675*	*1,160*	*34'9"*	*22'7⅛"*	*7'*	*168.8*	*19.10*	*6.38*	*6.84*
rfield Aircraft Corp	*75*			*CML*	2	*Ly.*	*75*	*S.L.*	*18*	*350*	*5.5*	*80*	*120*	*S.L.*	*108*	*S.L.*	*38*	*750*	*17,000*	*9.0*	*17.6*	*750*	*1,320*	*32'*	*20'6"*	*6'8⅝"*	*147.18*	*17.16*	*5.16*	*6.33*
rfield Aircraft Corp	90	611		CML	2	War.	90	S.L.	18	330	6.5	80	133	S.L.	120	S.L.	40	1,050	20,000	9.0	14.7	826	1,326	32'	20'3"	6'8⅝"	147.0	17.16	5.16	6.33
rfield Aircraft Corp	*145*			*OBL*	2	*War.*	*90*	*S.L.*	*32*	*400*	*9.0*	*86*	*125*	*S.L.*	*113*	*S.L.*	*32*	*900*	*16,000*	*7.0*	*13.4*	*1,300*	*1,950*	*U 31'1" L 28'8"*	*22'11"*	*8'5"*	*278.0*	*31.16*	*4.07*	*7.09*
vin Aircraft & Engines, Inc	Sportster-7000	*574	2,795	CML	2	K-R	70	S.L.	24	500	4.8	76	115	800	103	800	38	670	13,000	8.8	20.8	853	1,460	35'	22'3"	6'9"	166.0	19.75	5.17	6.92
vin Aircraft & Engines, Inc	Sportster-9000KR	*591	3,295	CML	2	K-R	90	S.L.	24	500	5.0	76	125	800	112	800	38	1,000	15,000	8.8	16.2	830	1,460	35'	22'3"	6'9"	166.0	19.75	5.17	6.92
vin Aircraft & Engines, Inc	Sportster-9000	*624	On req.	CML	2	War.	90	S.L.	24	450	5.7	76	123	800	110	800	38	1,000	15,000	8.8	16.2	861	1,460	35'	22'3"	6'9"	166.0	19.75	5.17	6.92
vin Aircraft & Engines, Inc	Speedster-6000M	661	4,495	CML	2	Men.	125	S.L.	34	575	8.0	76	150	800	130	800	48	1,300	18,000	11.88	13.6	1,070	1,700	32'	22'10"	6'10.5"	143.2	13.13	10.3	6.0
vin Aircraft & Engines, Inc	Cloudster-8090	711	3,795	CML	2	K-R	90	S.L.	34	650	5.0		125	800	110	800	48	750	14,000	10.11	18.15	1,030	1,635	34'1¾"	21'6"	7'4"	161.8	13.13	8.45	5.75
vin Aircraft & Engines, Inc	Cloudster-8125	711	4,295	CML	2	K-R	120	S.L.	34	625	7.0		145	800	125	800	48	1,000	17,000	10.73	14.45	1,070	1,734	34'1¾"	21'6"	7'4"	161.8	13.13	8.45	5.75
in Aircraft & Engines, Inc.	*Cloudster-8130*			*CML*	3	*K-R*	*90*	*S.L.*	*34*	*625*	*5.0*		*125*	*800*	*110*	*800*	*50*	*650*	*13,000*	*11.12*	*20.0*	*1,100*	*1,800*	*34'1¾"*	*21'6"*	*7'4"*	*161.8*	*13.13*	*12.0*	*5.75*
in Aircraft & Engines, Inc.	*Cloudster-8135*			*CML*	3	*K-R*	*120*	*S.L.*	*34*	*600*	*7.0*		*145*	*800*	*125*	*800*	*50*	*900*	*15,000*	*11.12*	*15.0*	*1,120*	*1,800*	*34'1¾"*	*21'6"*	*7'4"*	*161.8*	*13.13*	*12.0*	*5.75*
in Aircraft & Engines, Inc.	*Model 165*			*CML*	2	*Con.*	*65*	*S.L.*	*18*	*496*	*3.65*		*105*		*98*		*40*	*600*	*12,000*	*8.2*	*20.77*	*730*	*1,350*	*34'*	*21'9"*	*7'7"*	*164.6*	*8.42*	*8.94*	*5.91*
in Aircraft & Engines, Inc.	*Model 175*			*CML*	2	*Con.*	*75*	*S.L.*	*18*	*404*	*4.45*		*115*		*105*		*40*	*750*	*14,000*	*8.2*	*18.0*	*730*	*1,350*	*34'*	*21'9"*	*7'7"*	*164.6*	*8.42*	*8.94*	*5.91*
E. Ross	*RS-1*			*OML*	2	*Con.*	*40*		*9*	*240*	*2.8*	*69*	*90*		*75*		*40*		*9,000*	*6.4*	*23.5*	*518*	*940*	*30'*	*20'*	*7'*	*147.0*	*13.5*	*3.85*	*5.67*
Aeronautical Co	S-C	658		OML	3	War.	145	S.L.	37	525	9.5	82	150	S.L.	135	8,500	45	900	17,200	10.7	14.8	1,345	2,150	57'6"	25'4½"	6'10"	202.0	16.2	5.1	6.6
Aeronautical Co	ST-A	571		OML	2	Men.	125	S.L.	24	366	8.0	80	126	S.L.	115	3,000	42	800	16,000	12.9	12.8	1,081	1,600	29'11"	21'5⅝"	6'11"	124.0	12.0	4.7	7.2
Aeronautical Co	ST-A Special	681		OML	2	Men.	150	3,000	24	326	10.0	80	142	3,000	128	3,000	42	975	18,600	12.9	10.7	1,083	1,600	29'11"	21'5⅝"	6'11"	124.0	12.0	4.7	7.2
an-Hammond Aircraft Corp	Y-1S	644	7,150	CML	2	Men.	150	3,000	43	570	8.5	80	125	3,000	113	3,000	39	725	17,000	10.7	15.0	1,475	2,250	40'	26'10¾"	7'10½"	210.0	14.25	25.25	
Aircraft Div.	*105*			*CML*	3	*Con.*	*75*	*S.L.*	*20*	*405*	*5.0*	*70*			*107.5*	*4,600*	*43*	*430*	*9,100*	*10.2*	*21.1*	*900*	*1,580*	*34'*	*22'2"*	*6'6"*	*155.0*	*18.02*	*8.41*	*6.76*
Aircraft Div.	*105*			*CML*	3	*Con.*	*80*	*S.L.*	*20*	*405*	*5.0*	*70*			*111*	*4,800*	*43*	*485*	*12,100*	*10.2*	*19.7*	*900*	*1,580*	*34'*	*22'2"*	*6'6"*	*155.0*	*18.02*	*8.41*	*6.76*
raft Aviation Corp	BC-65	*700	1,835	CML	2	Con.	65	S.L.	12	250	3.75		105	S.L.	95	S.L.	38	640	15,000	6.8	17.7	660	1,150	36'	22'	6'8"	169.0			
raft Aviation Corp	BL-65	*696	1,775	CML	2	Ly.	65	S.L.	12	250	3.75		105	S.L.	95	S.L.	38	640	15,000	6.8	17.7	660	1,150	36'	22'	6'8"	169.0			
raft Aviation Corp	BF-60	*699	1,795	CML	2	Fr.	60	S.L.	12	250	3.75		105	S.L.	95	S.L.	38	640	15,000	6.8	19.1	660	1,150	36'	22'	6'8"	169.0			
raft Aviation Corp	BL	*700	1,660	CML	2	Ly.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000	6.8	23.0	632	1,150	36'	22'	6'8"	169.0			
raft Aviation Corp	BC	*696	1,730	CML	2	Con.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000	6.8	23.0	632	1,150	36'	22'	6'8"	169.0			
raft Aviation Corp	BF	*699	1,685	CML	2	Fr.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000	6.8	23.0	632	1,150	36'	22'	6'8"	169.0			
raft Aviation Corp	BL-T (Trainer)	*700	1,495	CML	2	Ly.	50	S.L.	12	270	3.5		97	S.L.	88	S.L.	38	450	13,000	6.8	23.0	632	1,150	36'	22'	6'8"	169.0			
ircraft Co	UPF-7	642		OBL	2	Con.Ri.	220	S.L.	50	[19] 402	12.5		126	S.L.	100	S.L.	51	849	14,300	10.85	12.06	2,564	2,650	30'	23'1"	8'6"	243.6			
ircraft Co	YPF-7	586		OBL	2	Ja.Ri.	225	S.L.	50	[19] 440	12.4		130	S.L.	110	S.L.	51	921	15,000	10.85	11.80	2,579	2,650	30'	23'1"	8'6"	243.6			
ircraft Co	*LPF-7*			*OBL*	2	*Ly.Ri.*	*220*	*S.L.*	*50*	[19] *320*	*12.5*		*125*	*S.L.*	*105*	*S.L.*	*51*	*868*	*14,600*	*10.85*	*12.06*	*2,593*	*2,650*	*30'*	*23'1"*	*8'6"*	*243.6*			
Aire. Industries, Inc	OW5M	637	996	CML	2	Con.	40	S L.	9	250	3.0	66	93	S.L.	85	S.L.	32	460	12,000	6.6	25.7	528	950	34'4"	20'6"	7'	138.0	18.92	11.2	9.13
Aire. Industries, Inc	OW6M	636	996	CML	2	Aer.	36	S.L.	9	250	3.0	66	93	S.L.	85	S.L.	31	475	12,500	6.7	26.0	498	954	34'4"	21'1"	7'	138.0	18.92	11.2	9.13
Aire. Industries, Inc	*OW7M*		996	*CML*	2	*Welch 0-2*	*45*	*S.L.*	*9*	*250*	*3.1*	*70*	*96*	*S.L.*	*88*	*S.L.*	*29*	*550*	*13,500*	*5.99*	*20.0*	*500*	*950*	*36'*	*20'9"*	*7'*	*150.0*	*18.92*	*11.2*	*9.13*
Aire. Industries, Inc	*OW8M*		1195	*CML*	2	*Franklin*	*50*	*S.L.*	*10*	*290*	*3.5*	*72*	*100*	*S.L.*	*90*	*S.L.*	*32*	*630*	*14,000*	*6.6*	*19.0*	*538*	*950*	*34'4"*	*20'2"*	*7'*	*148.0*	*18.92*	*19.3*	*9.08*
Aire. Industries, Inc	*OW5M Trainer*		890	*CML*	2	*Con.*	*40*		*9*	*250*	*3.0*	*69*	*93*	*S.L.*	*85*	*S.L.*	*32*	*960*	*12,000*	*6.6*	*25.7*	*525*	*950*	*34'4"*	*20'6"*	*7'*	*148.0*	*18.92*	*11.2*	*9.13*
Aircraft Corp	*Swift W-2*		3,175	*2pcml*	2	*LeB5F*	*90*	*S.L.*	*25*	*500*	*5.0*	*78*	*132*		*125*	*2,500*	*40*	*1,000*	*16,000*	*10.0*	*15.5*	*765*	*1,400*	*30'*	*20'*	*6'8"*	*146.0*	*12.0*	*5.2*	*6.5*
ircraft Corp	P.T-7			OLB	2	War.	165		36	332.5			115		95		40	1,000		9.27	13.6		2,243	31'	24'3½"	8'9"	242.5	27.6		

ications

Area (Sq. Ft.)					Wings			Landing Gear						Fuselage or Hull†
Ailerons (total)	Fin	Rudder	Stabiliser	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	
					Mono									*Wl,ST,D*
19.8	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	ShMech	Ol	SkWh	ST,Wl,Fab
19.8	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	Sh,Mech	Ol	SkWh	ST,Wl,Fab
19.8	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	Sh,Mech	Ol	SkWh	ST,Wl,Fab
19.8	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	Sh,Mech	Ol	SkWh	ST,Wl,Fab
19.8	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	Sh,Mech	Ol	SkWh	ST,Wl,Fab
19.8	6.5	8.2	13.6	11.54	Sol,Sp	Sp	Fab	Fx	72	Sh 6.00x6	Sh,Mech	Ol	SkWh	ST,Wl,Fab
16.2	2.5	7.0	17.0	13.5	Sp,Box	W	Fab	Fx	70	Aut 20x9–4	Aut	Sc	Sk	ST,Wl,Fab
16.2	2.5	7.0	17.0	13.5	Sp,Box	W	Fab	Fx	70	Aut 20x9–4	Aut	Sc	Wh	ST,Wl,Fab
23.0	5.28	6.16	15.2	10.0	Spiral	.....	Fab	....	72	Firestone	Sh.Mech	Ol,Sp	Oleo	.....
					Sp,Ro	*Sp*	*Fab*	*Fx*	.....	*Go 6.50x10*	*Aut*	*Sc*	*Wh*	*ST,Wl,Fab*
19.2	*4.66*	*6.76*	*14.66*	*10 64*	*Sp*	*Nicrl.*	*Fab*	*Re*	*58*	*Ha,800:4*	*Hyd, Pal*	*Ru*	*Sk*	*D,525*
14.0	*6.5*	*5.8*	*16.07*	*.36*	*Spr,Ro*	*Sp*	*Fab*	*Re*	*8'9"*	*SmiBal8.00x4*	*Go,Hyd*	*Re,Oleo*	*Wh*	*ST,Fab*
					D,S	*D*	*AD,Fab*	*Fz*	.....	*Aw 22*	*Go*	.....	*Wh*	*ST,Wl,Fab*
13.65	*3.60*	*6.10*	*10.7*[5]	*9.10*	*Sol,LM D*	*Spr*	*Fab*	*Non RW*	*5'9"*	*Streamline 19x10 Tires*	*Mechanical Autofan*	*Shock Cord*	*Skid*	*Chrome Welded*
18.8	4.85	5.87	22.05	10.17	Lmd,Sp	W	Fab	Fx	78⅝	Go 18x8–3	GoMechDuc	Ol,Own	Wh	Wl,ST,Fab
18.8	*4.85*	*5.87*	*22.05*	*10.17*	*Lmd,Sp*	*W*	*Fab*	*Fz*	*78⅝*	*Go 18x8–3*	*GoMechDisc*	*Ol,Own*	*Wh*	*Wl,ST,Fab*
18.8	*4.85*	*5.87*	*22.05*	*10.17*	*Lmd,Sp*	*W*	*Fab*	*Fz*	*80*	*Go 18x8–3Hd*	*GoHydDisc*	*Ol,Own*	*Wh*	*Wl,ST,Fab*
16.8	*3.3*	*6.0*	*10.2*	*9.4*	*DI*	*D*	*D,Fab*	*Ty*	*84*	*Ha 7.00x4*	*HydGr*	*Ol,Erco*	.....	*D,Mo*
16.8	*3.3*	*6.0*	*10.2*	*9.4*	*DI*	*D*	*D,Fab*	*Ty*	*84*	*Ha 7.00x4*	*HydGr*	*Ol,Erco*	.....	*D,Mo*
16.6	*6.9*	*14.5*	*26.7*	*13.2*	*Sol,Sp*	*D*	*Ply*	*Fz*	*115*	.....	*Hy*	*Ol*	*Wh*	*ST,Wl,Fab*
17.4	.....	None	12.84	9.3	Sol,Sp	S,D	Fab	Ty	70	Shn,Lp6.00x6	Sh,Mech	OSpr	None	D,Mo
17.4	.....	*None*	*12.84*	*9.3*	*Sol,Sp*	*S,D*	*Fab*	*Ty*	*70*	*ShnLp 6.00x6*	*Sh,Mech*	*OSpr*	*None*	*D,Mo*
13.02	12.58	10.9	21.2	17.12	D	Me	D	Re	91	21" SlGen	Hyd	Aep	OlWh	AD,Rv
16.0	*5.0*	*5.0*	*14.0*	*10.0*	*Lmd,Sp*	*Sp*	*Fab*	*Fz*	*76*	*Aw 16x7–3*	*None*	*Sc*	*Wh*	*Sp,G,Ply*
.....	12.0	3.2	22.0	.....	ST	Ply	Pl,Fab	Fx	114.5	7.00x5 Gr	Mech,Ha	Ol,Bx	Wh	ST,Wl,Fab
.....	12.0	3.2	22.0	.....	ST	Ply	.....	Fx	114.5	7.00x5 Gr	Mech,Ha	Ol,Bx	Wh	ST,Wl,Fab
13.6	4.9	5.65	13.0	8.75	DI	D	Fab	Ol	76	Fi 16–6	Sh[6],Mech	Ol,Own	Spr	AD,Mo
13.0	4.9	5.65	13.0	8.75	DI	D	Fab	Ol	76	.....	Sh,Mech	Ol,Own	Spr	AD,Mo
13.0	4.9	5.65	13.0	8.75	DI	D	Fab	....	.....	.....	.....	.....	.....	AD,Mo
10.6	*4.3*	*6.5*	*12.4*	*7.62*	*Sp*	*Sp*	*Fab*	....	*80*	*Gr,Ha 8.00–5*	*Mech*	*Own*	*Sk*	*T*
10.6	*4.3*	*6.5*	*12.4*	*7.62*	*Sp*	*Sp*	*Fab*	....	*80*	*Gr,Ha 8.00–5*	*Mech*	*Own*	*Sk*	*T*
10.6	*4.3*	*6.5*	*12.4*	*7.62*	*Sp*	*Sp*	*Fab*	....	*80*	*Gr,Ha 8.00–5*	*Mech*	*Own*	*Sk*	*T*
13.5	*4.1*	*5.8*	*10.6*	*9.2*	*Sol,Sp*	*W*	*Fab*	*Fz*	*87.5*	*GoAirWheels*	*Go*	*Sc*	*Wh*	*ST,Wl,Fab*
13.5	4.1	5.8	10.6	9.2	Sol,Sp	W	Fab	Fx	87.5	EH 6.50x10	EH,Mech	Sc	Wh	ST,Wl,Fab
16.0	3.5	5.0	10.0	7.0	Sol,Sp	W	Fab	Fx	75	EH 6.50x10	EH,Mech	Sc	Wh	ST,Wl,Fab
14.0	*5.1*	*6.8*	*13.5*	*8.8*	*AD*[7]	*D*	*Fab*	*Re*	*68*	*Firestone 6.00x6*	*Sh-Mech*	*Sc*	*Wh*	*Semi Geodetic-AD*
12.40	*5.0*	*8.0*	*16.0*	*13.0*	*D*	*D*	*AD*	*Fz*	*100*	*18" Air Wheel*	*Mech or H*	*Aer*	*Wh*	*D, Mo, AD*
12.40	*5.0*	*8.0*	*16.0*	*13.0*	*D*	*D*	*AD*	*Fz*	*100*	*18" Air Wheel*	*Mech or H*	*Aer*	*Wh*	*D, Mo AD*
19.6	*7.6*	*7.2*	*19.2*	*13.6*	*Lmd, Sp.*	*Sp.*	*Fab*[10]	*Fz*	*96*	*Aut. 10x6.5*	*Aut.*	*Ol, Pas*	*Wh.*	*ST, Wl, Fab, D*
.....	.....	.....	.....	.....	AD	AD	AD	Fx	80	Aut 6.50–10	HcHyd	Air-kl	Pn	Stiff,Skin
Upper	.....	.....	.....	.....	*Sp*	*Me*	*Fab*	*Fz*	.....	*Go*	*HaGo*	.....	*Pn*	*Fab,Wl,ST Tube*
Lower											*ToeMech*			
12.7	*4.3*	*7.4*	*13.5*	*10.8*	*Sp*	*Me*	*Fab*	*Fz*	*72*	*Ha 6.00x6*	*ToeHyd*	*War*	.....	*Fab,Wl,ST Tube*
19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[15]	Ru	Sk[12]	ST,Wl,Fab
19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[15]	Ru	Sk[12]	ST,Wl,Fab
19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[15]	Ru	Sk[12]	ST,Wl,Fab
19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[15]	Ru	Sk[12]	ST,Wl,Fab
19.2	4.02	6.55	14.65	10.64	Sol,Sp	D	Fab	Fx	71	Ha 8.00x4	Hyd,Pal[15]	Ru	Sk[12]	ST,Wl,Fab
19.2	4.66	6.76	14.66	10.64	Sol,Sp	D	Fab	Fx	77	Ha 8.00x4	Hyd,Pal	Ol	FuSw Wh	ST,Wl,Fab
19.2	*4.66*	*6.76*	*14.66*	*10.64*	*Sol,Sp*	*D*	*Fab*	*Fz*	*77*	*Ha 8.00x4*	*Hyd. Pal*	*Ol*	*FuSw Wh*	*ST,Wl,Fab*
19.2	*4.02*	*6.76*	*14.65*	*10.64*	*Sol,Sp*	*D*	*Fab*	*Fz*	*74½*	*Ha 8.00x4*	*Hyd, Pal*	*Ru*	*FuSw Wh*	*ST,Wl,Fab*
19.10	6.38	6.84	10.57	11.0	Sp	Sp	Fab	[13]	69	Shinn 6.00x6	Mech,Shin	[17]	Spr	Wl,ST,Fab
19.10	*6.38*	*6.84*	*10.57*	*11.0*	*Sp*	*Sp*	*Fab*	[13]	*69*	*Shinn 6.00x6*	*Mech,Shin*	[17]	*Spr*	*Wl,ST,Fab*
19.10	*6.38*	*6.84*	*10.57*	*11.0*	*Sp*	*Sp*	*Fab*	[13]	*69*	*Shinn 6.00x6*	*Mech,Shin*	[17]	*Spr*	*Wl,ST,Fab*
17.16	*5.16*	*6.33*	*13.2*	*9.55*	*Sp*	*Sp*	*Fab*	[13]	*69.5*	*Shinn 6.00x6*	*Mech,Shin*	*RuRing*	*Spr*	*Wl, ST, Fab*
17.16	5.16	6.33	13.2	9.55	Sp	Sp	Fab	[13]	69.5	Shinn 6·00x6	Mech,Shin	RuRing	Spr	Wl,ST,Fab
31.16	*4.07*	*7.09*	*18.67*	*15.77*	*Sp*	*Sp*	*Fab*	[13]	*76.5*	*Go 22x10 AW*	*Go,Mech*	*Ol*	*Spr*	*Wl,ST,Fab*
19.75	5.17	6.92	15.04	12.12	Sol Sp	Sp	Fab	Fx	72	Go 18x8–3	GoMech	Hyd	Sk	ST,Wl,Fab
19.75	5.17	6.92	15.04	12.12	Sol Sp	Sp	Fab	Fx	72	Go 18x8–3	Go Mech	Hyd	Wh	ST,Wl,Fab
19.75	5.17	6.92	15.04	12.12	Sol Sp	Sp	Fab	Fx	72	Go 18x8–3	Go Mech	Hyd	Sk	ST,Wl,Fab
13.13	10.3	6.0	15.68	9.8	Sol Sp	Sp	Fab	Fx	72	Go 18x8–3	Go Mech	Hyd	Wh	ST,Wl,Fab
13.13	8.45	5.75	13.94	11.56	Sol Sp	Sp	Fab	Fx	80	Go 18x8–3	Go Mech	Hyd	Wh	ST,Wl,Fab
13.13	8.45	5.75	13.94	11.56	Sol Sp	Sp	Fab	Fx	80	Go 18x8–3	Go Mech	Hyd	Wh	ST,Wl,Fab
13.13	*12.0*	*5.75*	*13.94*	*11.56*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*80*	*Go 18x8–3*	*Go Mech*	*Hyd*	*Wh*	*ST,Wl,Fab*
13.13	*12.0*	*5.75*	*13.94*	*11.56*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*80*	*Go 18x8–3*	*Go,Mech*	*Hyd*	*Wh*	*ST,Wl,Fab*
8.42	*8.94*	*5.91*	*14.76*	*10.88*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*72*	*Sh*	*Sh,Mech*	*Hyd*	*Wh*	*ST,Wl,Fab*
8.42	*8.94*	*5.91*	*14.76*	*10.88*	*Sol,Sp*	*Sp*	*Fab*	*Fz*	*72*	*Sh*	*Sh,Mech*	*Hyd*	*Wh*	*ST,WlFab*
13.5	*3.85*	*5.67*	*15.12*	*10.32*	*Sp*	*Sp*	*Fab*	*Fz*	.....	*16x7–3 or 7–4*	.....	*Air,Whl*	*Sk*	*Wl,ST,Fab*
16.2	5.1	6.6	14.3	11.3	SMe	D	AD,Fab	Fx	96¾	Go 18x8–3	Go,Mech	Ol	Wh	D,Mo
12.0	4.7	7.2	12.0	10.0	Sol,Sp	D	Fab	Fx	66	Go 18x8–3	Go,Mech	Ol	Wh	D,Mo
12.0	4.7	7.2	12.0	10.0	Sol,Sp	D	Fab	Fx	66	Go 18x8–3	Go,Mech	Ol	Wh	D,Mo
14.25	25.25	.....	22.45	14.9	D	D	Fab	Fx	109	Sl 21	Hyd,Ha	Ol,War	.....	AD,Rv,AD
18.02	*8.41*	*6.76*	*14.20*	*10.75*	*Sol,Sp*	*Rjd*	*Fab*	*Fz*	*84*	*Ha 6.00x6*	*Gr,Hyd*	*Spr,Ol*	*Wh*	*ST,Wl,Fab*
18.02	*8.41*	*6.76*	*14.20*	*10.75*	*Sol,Sp*	*Rjd*	*Fab*	*Fz*	*84*	*Ha 6.00x6*	*Gr,Hyd*	*Spr,Ol*	*Wh*	*ST,Wl,Fab*
.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	.....	.....	.....	.....	Sc	Wh	ST,Wl,Fab
.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	.....	.....	.....	.....	Sc	Wh	ST,Wl,Fab
.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	.....	.....	.....	.....	Sc	Wh	ST,Wl,Fab
.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	.....	.....	.....	.....	Sc	Wh	.....
.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	.....	.....	.....	.....	Sc	Wh	.....
.....	.....	.....	.....	.....	Sol,Sp	Me	Fab	.....	.....	.....	.....	Sc	Wh	.....
.....	.....	.....	.....	.....	SolSp	Me	Fab	.....	.....	.....	.....	Sc	Wh	.....
.....	.....	.....	.....	.....	Sp	Sp	Fab	....	101	8.50x10	Ha,Hyd	Waco,Ol	Wh	.....
.....	.....	.....	.....	.....	Sp	Sp	Fab	....	101	8.50x10	Ha,Hyd	Waco,Ol	Wh	.....
.....	.....	.....	.....	.....	*Sp*	*Sp*	*Fab*	*101*	*8.50x10*	*Ha,Hyd*	*Waco,Ol*	*Wh*	.....	
18.92	11.2	9.13	14.4	11.2	Sp,I	Bass-	Fab	Fx	56½	Welch 16x7	None	Solid	Wh	ST,Wl,Fab
18.92	11.2	9.13	14.4	11.2	Sp,I	Bass-	Fab	Fx	56½	Welch 16x7	None	Solid	Wh	ST,Wl,Fab
18.92	*11.2*	*9.13*	*14.4*	*11.2*	*Sp,I*	*Bass-*	*Fab*	*Fz*	*56½*	*Welch 16x7*	*None*	*Solid*	*Steer-*	*ST,Wl,Fab*
18.92	*19.3*	*9.08*	*14.4*	*11.2*	*Sp,I*	*Bass-*	*Fab*	*Fz*	*56½*	*Welch 16x7*	*None*	*Solid*	*Wh*	*ST,Wl,Fab*
18.92	*11.2*	*9.13*	*14.4*	*11.2*	*Sp,I*	*Bass-*	*Fab*	*Fz*	*56½*	*Welch 16x7*	*None*	*Solid*	*Wh*	*ST,Wl,Fab*
12.0	*5.2*	*6.5*	*10.7*	*12.32*	*Sol,Sp*	*Ply*	*Ply,Me, Fab*	*Fz*	*96*	*6.00x6*	*Mech*	.....	*Wh*	*ST,Wl,Fab*
27.6	.....	.....	.....	.....	.....	.....	*Fab*	*Fz*	.....	*6.50x10*	*Go,Hyd*	.....	*W*	*Fab*

4—5 Seats

Manufacturer	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level
		General				**Power Plant**							**Performance**					
Beech Aircraft Corp.	D-17R	638		CBL	5	Wr,Ww	450	S.L.	101	815	23.0	99	211	S.L.	202	9,700	50	1,
Beech Aircraft Corp.	D-17A	713		CBL	5	Wr,Ww	320	S.L.	98	820	17.5	99	178	S.L.	170	9,600	50	
Beech Aircraft Corp.	D-17S	*649		CBL	5	Pwj[20]	450	S.L.	101	815	23.0	99	211	S.L.	204	10,000	50	1,
Beech Aircraft Corp.	E-17B	*641		CBL	5	Ja[20]	285	S.L.	75	725	17.0	93	185	S.L.	177	7,200	45	1,
Beech Aircraft Corp.	F-17D	*689		CBL	5	Ja[20]	330	3,700	75	725	17.5	99	190	S.L.	182	10,000	45	1,
Cessna Aircraft Co.	C-145	701		CML[21]	4	War,Ri	145	S.L.	*235	525	9.5	84	162	S.L.	151	8,200	49	1,
Cessna Aircraft Co.	C-165	701		CML[21]	4	War,Ri	165	S.L.	*235	485	10.8	86	*165	S.L.	157	8,200	49	1,
Cessna Aircraft Co.	*T-50*			*CML*[21]	5	*2Ja,Ri*	*450*	*S.L.*	*[28]120*	*750*	*28.0*	93	*195*	*S.L.*	*191*	*7,500*	*55*	*1,*
Fairchild Aircraft	F-24, W-40	707	5,995	CML*	4	War[30]	145	S.L.	60	720	9.5	86	135	S.L.	122	7,000	50	
Fairchild Aircraft	*F-24, R-40*		*7,230*	*CML.**	4	*Ran*[30]	*175*	*S.L.*	*40*	*500*	*10.0*	86					*50*	
Fleetwings, Inc.	*F-5*			*CMA*	4	*Ja*[30]	*285*	*S.L.*	*70*	*560*	*18.0*	*102*	*160*	*S.L.*	*144*	*S.L.*	*61*	
Fleetwings, Inc.	F-501	680		J		Ja	300	S.L.	70	516	18.0	102	150	S.L.	135		58	
Fleetwings, Inc.	F-501[37]	680				Ja	300	S.L.	70	516	18.0	102	150	S.L.	139	6,000	59	1,
Harlow Aircraft Co.	*PJC-2*			*CLM*	4	*War*	*145*	*S.L.*	*34*	*600*	*9.0*	*84*	*165*	*S.L.*	*160*	Maz.	*55*	
Howard Aircraft Corp.	DGA-8	*612		CML	4	Wr,Ww, Rm,Ri	320	S.L.	97	1,085	16.7	99	185	S.L.	187	12,000	53	1,
Howard Aircraft Corp.	*DGA-11*			*CML*	4	*Pwj*[30]	*400*	*5,000*	*97*	*850*	*23.0*	*99*	*195*	*S.L.*	*201*	*9,600*	*55*	*2,*
Howard Aircraft Corp.	*DGA-12*			*CML*	4	*Ja*[30]	*300*	*3,700*	*97*	*1,085*	*16.2*	*99*	*184*	*S.L.*	*184*	*7,000*	*53*	*1,*
Howard Aircraft Corp.	*DGA-15*			*CML*	5	*Pwj, Rm, Ri,*	*400*	*5,000*	*121*	*965*	*24.0*	*99*	*186*	*S.L.*	*191*	*9,600*	*60*	*1,*
Howard Aircraft Corp.	*DGA-15*			*CML*	5	*Jl,Rm,Ri*	*300*	*3,700*	*118*	*1,080*	*18.5*	*99*	*178*	*S.L.*	*171*	*6,000*	*60*	*1,*
Monocoupe Corp.	*Twin Monocoach-H*			*CML*	4–5	*2Lam*	*180*	*S.L.*	*70*	*862*	*10.0*	*78*	*150*	*S.L.*	*135*	*8,600*	*48*	
Ong Aircraft Corp.	*M-32W*		*6,485*	*CML*	4	*War*	*145*	*S.L.*	*40*	*580*	*9.5*	*90*	*156*	*S.L.*	*135*	*S.L.*	*50*	
Ong Aircraft Corp.	*M-32*			*CML*	4	*Men*	*150*	*3,000*	*40*	*572*	*10.0*	*84*	*159*	*3,000*	*139*	*3,000*	*50*	*1,*
Ong Aircraft Corp.	*M-32W1*			*CML*	4	*War*	*165*	*S.L.*	*40*	*590*	*10.0*	*90*	*164*	*S.L.*	*141*	*S.L.*	*55*	*1,*
Spartan Aircraft Co., Inc.	Executive 7W	628		CML	5	Pwj	450	S.L.	112	900	24.0	102	212	5,000	205	9,600	57	1,
Stinson Aircraft Div.	SR-10B	678		CML	4–5	Ly,Rm	225	S.L.	76	660	17.0	102			147.5	4,000	57	
Stinson Aircraft Div.	SR-10C	678		CML*	4–5	Ly,Rm	245	S.L.	76	640	18.0	102			151.5	4,000	57	
Stinson Aircraft Div.	SR-10D	679		CML	4–5	Wr, Ww, Rm	285	S.L.	100	830	18.8	102			156	5,500	60	1,
Stinson Aircraft Div.	SR-10E	679		CML*	4–5	Wr, Ww, Rm	320	S.L.	100	835	18.8	102			157	6,300	60	1,
Stinson Aircraft Div.	SR-10F	685		CML*	4–5	Pwj,Sb,Rm	300	5,000	100	700	25.0	102			175	9,600	62	1,
Stinson Aircraft Div.	SR-10F	685		CML*	4–5	Pwj,Tb,Rm	420	S.L.	100	685	25.0	102			171	7,000	62	1,
Stinson Aircraft Div.	SR-10G	678		CML	4–5	Ly,Rm	275	S.L.	100	790	18.4	102			151	4,300	60	
Stinson Aircraft Div.	*SR-10J*			*CML*	4–5	*Ly,Rm*	*285*	*S.L.*	*100*	*835*	*18.8*	*102*			*155*	*4,000*	*60*	*1,*
Stinson Aircraft Div.	SR-10K	679		CML*	4–5	Wr, Ww, Rm	420	1,400	100	610	27.0	102			172.5	5,500	62	1,
Waco Aircraft Co.	*ARE*		*13,500*	*CBL*	5	*Ja,Ri,Rm*	*300*	*3,700*	*125*[19]	*1,080*	*17.4*		*185*	*S.L.*	*177*	*8,500*	*58*	*1,*
Waco Aircraft Co.	*SRE*		*17,800*	*CBL*	5	*Pwj,Ri,Rm*	*400*	*5,000*	*125*[19]	*840*	*22.7*		*200*	*S.L.*	*195*	*9,600*	*60*	*1,*
Waco Aircraft Co.	*WRE*		*17,200*	*CBL*	5	*Wr,Ri,Rm*	*420*	*1,400*	*125*[19]	*830*	*25.6*		*204*	*S.L.*	*200*	*9,600*	*60*	*1,*
Waco Aircraft Co.	YKS	*626	7,110	CBL	5	Ja,Ri	225	S.L.	70[19]	518	15.5		144	S.L.	135	6-10,000	52	
Waco Aircraft Co.	ZKS	*626	7,890	CBL	5	Ja,Ri	285	S.L.	70[19]	504	17.0		152	S.L.	144	6-10,000	52	
Waco Aircraft Co.	VKS	*648	7,070	CBL	5	Con,Ri	240	S.L.	70[19]	492	16.5		145	S.L.	136	6-10,000	52	
Waco Aircraft Co.	AVN	677	12,800	CBL	5	Ja,Ri	300	3,700	95[19]	625	17.4		161	S.L.	151	8,500	56	
White Aircraft Corp.	New Standard D-25	108		OLB	5	Wr	220	S.L.	62	450	12.0	108	125	S.L.	95	S.L.	40	

6 or more Seats

Manufacturer	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level
		General				**Power Plant**							**Performance**					
Air Transport Mfg. Co., Ltd.	T-6	223		CML	6	3-K	300	S.L.	85	450	18.0	78	140	1,000	125	1,000	47	1
Air Transport Mfg. Co., Ltd.	*B-8*			*CML*	8	*2Wr,Ww*	*640*	*S.L.*	*140*	*720*	*35.0*	*100*	*195*	*S.L.*	*180*	*S.L.*	*55*	*1,*
Barkley-Grow Aircraft Corp.	T8P-1[29, 30]	662			10	2Pwj	800	5,000	*160	750	46.5	102	205	5,000	192	9,600	63	1,
Beech Aircraft Corp.	18-D	*684		CML	8–9	2JaRmRi	660	3,700	160	850	35.0	99	206	S.L.	200	10,000	59	1,
Beech Aircraft Corp.	18-S	710		CML	6–8	2Pwj[30]	900	S.L.	210	1,000	46.0	99	230	S.L.	220	12,000	61	1,
Beech Aircraft Corp.	18-A	*630		CML	8–9	2WrWw[30]	640	S.L.	160	850	35.0	99	206	S.L.	200	10,000	59	1,
Bellanca	Aircruiser Cargo	*563		CQL	15	WrCy	715	3,900	300	610	42.0	150	165	7,000	155	12,000	64	
Bellanca	Sr. Pacemaker	*578		CML	6	WrWh	420	S.L.	200	860	25.2	108	160	S.L.	145	S.L.	64	
Bellanca	Sr. Skyrocket	*565		CML	6	Pww	550	5,000	200	600	36.3	108	190	5,000	180	12,000	64	1,
Boeing Aircraft Co.	*307 Stratoliner*			*CML*	38	*4WrCy*[40]	*4,400*	*S.L.*	*1,700*	*1,675*	*158*	*138*	*240*	*6,000*	*215*	*10,000*	*70*	*1,*
Boeing Aircraft Co.	314	704		CMF	89	4WrCyy[60]	6,000	S.L.	4,200	3,100		168	190		175	10,000	70	
Burnelli Aircraft Corp.	*UB-14*			*CML*	14	*2Pwh*	*1,500*	*7,000*	*300*	*600*	*108.0*		*225*	*6,000*	*185*	*6,000*	*63*	*1,*
Burnelli Aircraft Corp.	*CB-34*			*CML*	34	*3Wr*	*2,700*	*6,000*	*870*	*1,440*	*207.0*	*138*	*247*	*6,000*	*206*	*6,000*	*65*	*1,*
Consolidated Aircraft Corp.	*28 Com. Amphibian*			*CMA*	20	*2Pwww*	*2,100*	*7,500*		*4,000*			*199*	*7,800*	*179*	*7,800*	*69*	
Consolidated Aircraft Corp.	*28 Com. Flying Boat*			*CMF*	20	*2Pwww*	*2,100*	*7,500*		*4,000*			*199*	*7,800*	*179*	*7,800*	*69*	
Consolidated Aircraft Corp.	*29 Com. Flying Boat*			*CMF*	62	*2Pwww*	*4,200*	*7,800*		*5,200*			*226*	*7,800*	*210*	*10,000*	*70*	
Cunningham-Hall Aircraft Corp.	PT-6F	177		CBL	6	WrWh	365	S.L.	90	700	18.0	108	150	S.L.	125	S.L.	50	1,
St. Louis Airplane Div., Curtiss-Wright	*Curtiss-Wright Transport*			*CML*	36–40[21]	R975E-1 *2WrCy DoubleRow*	[22]	[23]	*1,000*	*1,500*	*140*	*180*	*243*	*13,000*	*210*	*10,000*	*70*	*1,*
Douglas Aircraft Co., Inc.	DC-2	[41]540		CML	14	2WrCy[40]	1,420	7,000	510	1,225	80.0	132	210	8,100	196	12,500	60	1,
Douglas Aircraft Co., Inc.	DC-3	618		CML	21	2WrCy[40]	2,400		822	2,125	93.6	138	219		196		67	1,
Douglas Aircraft Co., Inc.	DST	607		CML	14	2WrCy	2,200		822	2,125	100.0	138	215		191		67	1,
Douglas Aircraft Co., Inc.	*DC-4*			*CML*	40	*4WrCy*[40]	*4,800*		*1,700*	*2,600*			*257*		*235*		*73.8*	*1,*
Douglas Aircraft Co., Inc.	*DC-5*			*CML*	16	*2WrCy*[40]	*2,200*		*550*	*1,500*			*230*		*202*		*65*	*1,*
Grumman Aircraft Engineering Corp.	G-21A	654		CMA	8	PwjRi	800	5,000	220	1,000	51.0	102	201	5,000	190	9,600	62	1,
Lockheed Aircraft Corp.	Electra 10A	551		CML	12	2Pwj[30]	800	5,000	194	810	52.0	108	202	5,000	190	9,600	64	1,
Lockheed Aircraft Corp.	Electra 10E	590		CML	12	2Pww[30]	900	10,500	250	830	71.0	108	212	10,500	202	9,600	65	1,
Lockheed Aircraft Corp.	Model 12A	616		CML	8	2Pwj[30]	800	5,000	280	950	52.0	108	225	5,000	212	9,600	65	1,
Lockheed Aircraft Corp.	*Model 18 (10ZA)*			*CML*	17	*2WrCy*	*1,800*	*6,700*	*644*	*1,480*	*59.0*	*126*	*252*	*7,900*	*233*	*12,000*	*65*	*1,*
Lockheed Aircraft Corp.	*Model 18-36 (F-65)*			*CML*	17	*2WrCy*	*1,520*	*5,800*	*644*	*1,200*	*55.0*	*126*	*250*	*16,500*	*230*	*18,000*	*65*	*1,*
Lockheed Aircraft Corp.	*Model 18-56 (205A)*			*CML*	17	*2WrCy*	*2,000*	*4,500*	*644*	*1,200*	*50.5*	*126*	*269*	*15,300*	*253*	*19,000*	*65*	*1,*
Lockheed Aircraft Corp.	*Model 18-14 (84C4G)*			*CML*	17	*2Pwww*	*2,200*	*7,500*	*644*	*1,200*	*55.0*	*126*	*273*	*16,700*	*253*	*19,000*	*65*	*2,*
Lockheed Aircraft Corp.	*Model 18-07 (81E3G)*			*CML*	17	*2Pwh*	*1,500*	*7,000*	*644*	*1,515*	*55.0*	*126*	*240*	*8,000*	*220*	*12,000*	*65*	*1,*
Lockheed Aircraft Corp.	*Model 44-56 (205A)*			*PCLM*	34	*4WrCy*	*4,000*	*4,500*	*1,200*	*1,600*	*113.0*	*132*	*294*	*15,300*	*262*	*19,000*	*79*	*1,*
Lockheed Aircraft Corp.	*Model 44-36 (F65)*			*PCLM*	34	*4WrCy*	*3,040*	*5,800*	*1,200*	*1,510*	*110.0*	*132*	*267*	*16,500*	*244*	*18,000*	*78.5*	*1,*
Lockheed Aircraft Corp.	*Model 44 (81E3G)*			*PCLM*	34	*4Pwh*	*3,000*	*7,000*	*1,200*	*1,510*	*110.0*	*132*	*255*	*7,000*	*232*	*14,000*	*78.5*	*1,*
Lockheed Aircraft Corp.	*Model 44 (84C4-G)*			*PCLM*	34	*4Pwww*	*4,200*	*7,500*	*1,200*	*1,570*	*125.0*	*132*	*296*	*16,700*	*262*	*19,000*	*79*	*1,*
Glenn L. Martin Co.	*130*			*CMF*	52	*4Pwww*	*3,320*	*6,000*	*4,000*	*3,200*	*178.0*		*180*	*8,000*	*130*	*10,000*	*70*	
Glenn L. Martin Co.	156-C	697		CMF	53	4WrCy[60]	3,400	5,800	3,800			144	182	5,800	140	10,200	67	
Glenn L. Martin Co.	*157-F*			*CMF*	57	*4Pwh*[30]	*4,200*	*6,500*	*4,460*				*203*	*6,500*	*145*	*10,000*	*71*	
Vought-Sikorsky Div., United Aircraft	S-42-B	592		CMF	37	4Pwh[30]	3,000	7,000	1,240	1,200	168.0	138	188	7,000	163	7,000	65	
Vought-Sikorsky Div., United Aircraft	S-43	593		CMA	18	2Pwh[30]	1,500	7,000	400	775	84.0	138	190	7,000	166	7,000	65	1,
Vought-Sikorsky Div., United Aircraft	S-43-B	593		CMA	18	2Pwh[30]	1,500	7,000	400	775	84.0	138	190	7,000	166	7,000	65	1,
Vought-Sikorsky Div., United Aircraft	*S-44*			*CMF*	[30]32	*4Pwh*	*4,200*	*7,500*	*3,900*	*3,800*		*150*			*175*	*7,500*	*65*	

Key to Abbreviations Used in All Aircraft Specification Tables

* — Approved on floats
A — Amphibian
Acp — Aircraft Prod
AD — Alclad
Aer — Aerol
Al — Aluminum
Aln — Allison
Apl — Applied for
Ar- — Aeronca
Aut — Autofan
Aw — Air Wheels
B — Biplane
Bo — Bolted
Box — Box spar
Bx — Bendix
C — Closed
CG — Coast Guard
Con — Continental
Crit — Critical
Cy — Cyclone
Cyy — Two row Cyclone
D — Aluminum Alloy
E.H. — Ebert Hatch
F — Flying Boat
Fab — Fabric
Fl — Floats
Fo — Ford
Fr — Franklin
Fx — Fixed
G — Glued
Gen — General
Go — Goodyear
Gr — Goodrich
Gy — Autogiro
Ha — Hayes
Yyd — Hydraulic
I — "I" section
Id — Inverted
Ja — Jacobs
K — Kinner
Kr — Ken Royce
L — Landplane
Lam — Lambert
LeB — LeBlond
Len — Lenape
Lmd — Laminated
Lp — Low Pressure
Ly — Lycoming
M — Monoplane
Me — Metal
Mech — Mechanical
Men — Menasco
Mil — Military
Mo — Monocoque
Mu — Multicellular
O — Open
Ol — Oleo
Op — Optional
Pal — Palmer
Ply — Plywood
Pn — Pneumatic
Pob — Pobjoy
Pwh — P & W Hornet
Pwj — P & W Wasp, Jr.
Pwwj — P & W Twin Wasp, Jr.
Pww — P & W Wasp
Pwww — P & W Twin Wasp
Q — Sesquiplane
Ran — Ranger
Re — Retractable
Ri — Lord Instrument Mounting
Rm — Lord Engine Mounting
RW — Retractable Wheel
Ro — Routed
Ru — Rusco
Rv — Riveted
S — Steel
Sc — Shock cord
Se — Security
Sk — Ski
Sl — Str
S.L. — Sea
Sh — Shi
S.M.B. — Sin
Sol — Sol
Sp — Spr
Spr — Spr
SS — Sta
Stu — Stu
Sz — Sze
T — Tul
Trs — Tru
Ty — Tro
W — Wo
War — Wa
Wel — We

Performance					Weights				Dimensions			Area (sq. ft.)						Wings			Landing Gear							
Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit	Fuselage or Hull†
202	9,700	50	1,600	24,000	14.2	10.0	.....	4,200	32'	26'10"	8'	296.4	23.75	6.56	8.7	24.5	16.6	Sp,Sol	Sp	Fab	Re	86	Go 7.50x10	Hyd	Spr,Ol	Rw	ST,Wl,Fab
170	9,600	50	900	15,500	14.2	13.1	.....	4,200	32'	26'10"	8'	296.4	23.75	6.56	8.7	24.5	16.6	Sp,Sol	Sp	Fab	Re	86	Go 7.50x10	Hyd	Spr,Ol	Rw	ST,Wl,Fab
204	10,000	50	1,600	26,000	14.2	10.5	.....	4,200	32'	26'10"	8'	296.4	23.75	6.56	8.7	24.5	16.6	Sp,Sol	Sp	Fab	Re	86	Go 7.50x10	Hyd	Spr,Ol	Rw	ST,Wl,Fab
177	7,200	45	1,200	18,000	11.3	11.7	.....	3,350	32'	25'11"	8'	296.4	23.75	5.54	8.7	23.7	15.1	Sp,Sol	Sp	Fab	Re	86	Go 7.50x10	Hyd	Spr,Ol	Rw	ST,Wl,Fab
182	10,000	45	1,300	20,000	11.9	10.7	.....	3,550	32'	25'11½"	8'	296.4	23.75	5.54	8.7	23.7	15.1	Sp,Sol	Sp	Fab	Re	86	Go 7.50x10	Hyd	Spr,Ol	Rw	ST,Wl,Fab
151	8,200	49	1,000	18,000	13.0	16.2	1,380	2,350	34'2"	24'8"	7'0"	181.0	12.35	7.1	6.11	17.3	13.0	Lmd,Sp	Sp	Fab,D	Fx	87	6.50x10[22]	Go,Hyd	OlCessna	Wh	ST,Wl,Fab
157	8,200	49	1,125	19,300	13.0	14.2	1,400	2,350	34'2"	25'0"	7'0"	181.0	12.35	7.1	6.11	17.3	13.0	Lmd,Sp	Sp	Fab,D	Fx	87	6.50x10[22]	Go,Hyd	OlCessna	Wh	ST,Wl,Fab
191	*7,500*	*55*	*1,525*	*22,000*	*16.9*	*10.2*	*3,500*	*5,000*	*41'11"*	*32'9"*	*9'11"*	*295.0*	*18.0*	*10.9*	*14.9*	*40.0*	*22.7*	*Lmd,Sp*	*Sp*	*Fab,D*	*Re*	*151*	*8.50x10*	*Go,Hyd*	*Ol,Bx*	*Wh*	*ST,Wl,Fab*
122	7,000	50	720	15,700	13.2	17.58	1,482	2,550	36'4"	23'9"	8'	193.3	21.0	6.1	10.1	21.9	13.5	Sol,Sp	Sp	Fab	Fx	111	Ha 7.50x10	Hy,Pal	Ol	Wh	ST,Wl,Fab
.....	.....	*50*	.....	.....	*13.2*	*14.57*	*1,561*	*2,550*	*36'4"*	*24'10"*	*8'*	*193.3*	*21.0*	*6.1*	*10.1*	*21.9*	*13.5*	*Sol,Sp*	*Sp*	*Fab.*	*Fx*	*111*	*Ha 7.50x10*	*Hy,Pal*	*Ol*	*Wh*	*ST,Wl,Fab*
144	*S.L.*	*61*	*950*	*15,000*	*14.7*	*12.1*	*2,320*	*3,450*	*40'6"*	*32'0"*	*12'6"*	*235.0*	*23.3*	*18.9*	*12.5*	*8.7*	*15.1*	*SS,Wl*	*SSWl*	*Fab*	*Re*	*93½*	*7½x10*	*Gr Pal*	*Bx*	*Wh*	*SS,Wl*
135	.....	58	914	14,000	15.96	12.5	2,453.7	3,750	40'6"	32'0"	12'6"	235.0	23.3	18.9	12.5	8.7	15.1	SS,Wl	SSWl	Fab	Re	93½	7½x10	GrPal	Bx	Wh	SS,Wl
139	6,000	59	1,078	14,300	16.0	12.67	2,509.7	3,850	40'6"	32'0"	12'6"	235.0	23.3	18.9	12.5	8.7	15.1	SS,Wl	SSWl	Fab	Re	93½	7½x10	GrPal	Bx	Wh	SS,Wl
160	*Max.*	*55*	*750*	*15,500*	*14.05*	*17.94*	*1,700*	*2,600*	*35'9¾"*	*23'4"*	*7'3"*	*185.0*	*13.02*	*12.58*	*10.9*	*21.2*	*17.12*	*D*	*Me*	*D*	*Re*	*91*	*21"Sl Gen*	*Hyd*	*Aer,Ol*	*Wh*	*AD,Rs*
187	12,000	53	1,800	20,000	20.48	11.87	2,350	3,800	38'	25'8"	8'5"	185.5	18.54	9.81	9.62	20.44	19.4	Sol,Sp	Sp	Ply	Fx	90	Gr 7.50x10	Gr,Hyd	Ol,Hwd	Wh	ST,Wl,D,Fab
201	*9,600*	*55*	*2,200*	*26,000*	*22.15*	*9.11*	*2,500*	*4,100*	*38'*	*25'5"*	*8'5"*	*185.5*	*18.54*	*9.81*	*9.62*	*20.44*	*19.4*	*Sol,Sp*	*Sp*	*Ply*	*Fx*	*90*	*Gr 8.50x10*	*Gr,Hyd*	*Ol,Hwd*	*Wh*	*ST,Wl,D,Fab*
184	*7,000*	*53*	*1,550*	*18,000*	*18.1*	*12.6*	*2,300*	*3,800*	*38'*	*25'6"*	*8'5"*	*210.0*	*18.54*	*9.81*	*9.62*	*20.44*	*19.4*	*Sol,Sp*	*Sp*	*Ply*	*Fx*	*90*	*Gr 7.50x10*	*Gr,Hyd*	*Ol,Hwd*	*Wh*	*ST,Wl,D,Fab*
191	9,600	60	1,560	21,500	20.7	10.9	2,725	4,350	38'0"	24'10"	8'5"	210.0	18.54	11.72	9.62	21.27	21.20	Sol,Sp	Sp	Ply	Fx	100	8.50x10	Gr,Hyd	Ol,Hwd	Wh	ST,Wl,D,Fab
171	*6,000*	*60*	*1,000*	*15,500*	*20.7*	*14.5*	*2,500*	*4,350*	*38'0"*	*25'0"*	*8'5"*	*210.0*	*18.54*	*11.72*	*9.62*	*21.27*	*21.20*	*Sol,Sp*	*Sp*	*Ply*	*Fx*	*100*	*8.50x10*	*Gr,Hyd*	*Ol,Hwd*	*Wh*	*ST,Wl,D,Fab*
135	*8,600*	*48*	*560*	*10,800*	*13.9*	*17.9*	*1,882*	*3,220*	*36'*	*24'6"*	*7'10"*	*231.0*	*18.5*	*11.68*	*8.37*	*28.32*	*14.76*	*Sp,Box*	*W*	*Fab*	*Re*	*120*	*Go 7.50x10*	*Go,Hyd*	*Ol*	*Wh*	*ST,Wl,Fab*
135	*S.L.*	*50*	*900*	*17,000*	*14.3*	*16.4*	*1,395*	*2,375*	*33'6"*	*26'1"*	*7'5"*	*166.0*	*17.5*	*8.7*	*8.3*	*16.1*	*11.6*	*Sol,Sp*	*Sp*	*Fab*	*Fx*	*109*	*6.50x10*	*Det.Mich*	*Air-l*	*Wh*	*ST,Wl,Fab*
139	*3,000*	*50*	*1,000*	*19,000*	*14.3*	*15.8*	*1,325*	*2,375*	*33'6"*	*26'11"*	*7'5"*	*166.0*	*17.5*	*8.7*	*8.3*	*16.1*	*11.6*	*Sol,Sp*	*Sp*	*Fab*	*Fx*	*109*	*6.50x10*	*Det.Mich*	*Air-l*	*Wh*	*ST,Wl,Fab*
141	*S.L.*	*50*	*1,000*	*18,000*	*14.3*	*14.4*	*1,410*	*2,375*	*33'6"*	*26'1"*	*7'5"*	*166.0*	*17.5*	*8.7*	*8.3*	*16.1*	*11.6*	*Sol,Sp*	*Sp*	*Fab*	*Fx*	*109*	*6.50x10*	*Det.Mich*	*Air-l*	*Wh*	*ST,Wl,Fab*
205	9,600	57	1,530	22,000	17.6	9.8	2,992	4,400	39'	26'10"	8'	250.8	23.2	9.7	10.0	21.8	16.8	St,Wl	Me	AD	Re	124	Go 7.50x10	Go,Hyd	Aer	Wh	ST,Wl,AD
147.5	4,000	57	855	13,800	15.0	17.2	2,515	3,875	41'10½"	27'10¼"	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
151.5	4,000	57	950	15,000	15.0	15.8	2,515	3,875	41'10½"	27'10¼"	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
156	5,500	60	1,040	15,800	16.0	14.6	2,730	4,150	41'10½"	28'	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
157	6,300	60	1,235	17,400	16.0	13.0	2,730	4,150	41'10½"	28'	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
175	9,600	62	1,390	21,000	18.0	11.6	3,040	4,650	41'10½"	28'2½"	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
171	7,000	62	1,450	19,000	18.0	11.1	3,040	4,650	41'10½"	28'2½"	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
151	4,300	60	.....	15,300	16.0	15.1	2,630	4,150	41'10½"	27'10¼"	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
155	*4,000*	*60*	*1,040*	*15,800*	*16.0*	*14.6*	*2,650*	*4,150*	*41'10½"*	*27'10¼"*	*8'7"*	*258.5*	*22.02*	*12.0*	*15.16*	*25.08*	*19.75*	*STWlTrs*	*Rv,D*	*Fab*	*Fx*	*111½*	*Ha 7.50x10*	*Gr,Hyd*	*Spr,Ol*	*Wh*	*ST,Wl,Fab*
172.5	5,500	62	1,450	19,400	18.0	11.1	3,045	4,650	41'10½"	28'3"	8'7"	258.5	22.02	12.0	15.16	25.08	19.75	STWlTrs	Rv,D	Fab	Fx	111½	Ha 7.50x10	Gr,Hyd	Spr,Ol	Wh	ST,Wl,Fab
177	*8,500*	*58*	*1,170*	*18,000*	*16.25*	*13.6*	*2,563*	*3,999*	*34'9"*	*27'10"*	*8'8"*	*246.0*	.....	.....	.....	.....	.....	*Sp*	*Sp*	*Ply*	.....	*101*	*7.50x10*	*Go,Hyd*	*Waco,Ol*	*Wh*	.....
195	*9,600*	*60*	*1,550*	*23,500*	*17.06*	*10.5*	*2,734*	*4,200*	*34'9"*	*27'10"*	*8'8"*	*246.0*	.....	.....	.....	.....	.....	*Sp*	*Sp*	*Ply*	.....	*101*	*7.50x10*	*Go,Hyd*	*Waco,Ol*	*Wh*	.....
200	*9,600*	*60*	*1,600*	*24,000*	*17.06*	*10.0*	*2,761*	*4,200*	*34'9"*	*27'10"*	*8'8"*	*246.0*	.....	.....	.....	.....	.....	*Sp*	*Sp*	*Ply*	.....	*101*	*7.50x10*	*Go,Hyd*	*Waco,Ol*	*Wh*	.....
135	6-10,000	52	750	12,500	13.32	14.44	1,945	3,250	33'3"	25'4"	8'4"	244.0	.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	102	7.50x10	Ha,Hyd	Waco,Ol	Wh	.....
144	6-10,000	52	850	14,000	13.32	11.40	1,981	3,250	33'3"	25'4"	8'4"	244.0	.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	102	7.50x10	Ha,Hyd	Waco,Ol	Wh	.....
136	6-10,000	52	800	13,000	13.32	13.54	1,960	3,250	33'3"	25'4"	8'4"	244.0	.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	102	7.50x10	Ha,Hyd	Waco,Ol	Wh	.....
151	8,500	56	950	14,200	15.45	12.67	2,564	3,800	34'9"	27'7"	8'6"	246.0	.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	99	8.50x10[22]	[illegible]yd	Waco,Ol	None	.....
95	S.L.	40	800	18,000	10.0	15.4	2,010	3,400	45'	26½'	10'5"	350.0	26.0	3.5	10.7	19.5	17.1	Sp	Sp	Fab	Fx	96	Wire 32x6	Yes	Ol	W	D,Ru,Fab

125	1,000	47	1,100	18,000	14.3	15.0	2,752	4,500	48'10"	33'6"	9'6"	315.0	32.0	5.5	12.0	29.0	19.0	Sp,Box	W	Fab	Fx	165½	Aut 9.50x12	Aut	Ol	Wh	ST,Wl,Fab
180	*S.L.*	*55*	*1,400*	*22,000*	*18.05*	*16.16*	*3,730*	*6,500*	*50'*	*35'4"*	*10'4"*	*360.0*	*30.5*	*10.9*	*13.4*	*35.7*	*22.6*	*Ro,Sp*	*W*	*Fab*	*Fz*	*146*	*Aut 27"*	*Aut,Hyd*	*Ol*	*Wh*	*ST,Wl,Fab*
192	9,600	63	1,300	19,060	24.8	10.9	5,649	8,750	50'8¾"	36'2"	9'7½"	354.0	20.52	13.66	19.96	39.42	28.19	D	None	D	Re	168	Go 30x13-6	Go,Hyd	Aer	Wh	D,Rv,Mo
200	10,000	59	1,100	17,200	20.7	10.9	.....	7,200	47'8"	34'3"	9'5"	347.0	23.9	16.3	17.3	38.2	27.2	ST,Wl	D	D	Re	154¾	Go 29x13.5	Hyd,Go	Air,Oil	Rw	D
220	12,000	61	1,850	27,000	21.5	8.3	.....	7,500	47'8"	34'3"	9'5"	347.0	23.9	16.3	17.3	38.2	27.2	ST,Wl	D	D	Re	154¾	Go 29x13.5	Hyd,Go	Air,Oil	Rw	D
200	10,000	59	1,200	20,000	20.7	11.2	.....	7,200	47'8"	34'3"	9'5"	347.0	23.9	16.3	17.3	38.2	27.2	ST,Wl	D	D	Re	154¾	Go 29x13.5	Hyd,Go	Air,Oil	Rw	D
155	12,000	64	700	16,000	17.20	15.90	6,115	11,400	65'	42'9"	11'6½"	664.0	46.0	21.0	21.0	60.0	30.0	Ro,Sp	S	Fab	Fx	216	GoAW36x16	Go	Ol	Wh	ST,Wl,Fab
145	S.L.	64	700	12,000	15.50	13.30	3,250	5,600	50'6"	27'11"	8'6"	359.0	40.0	16.0	12.0	39.0	23.40	Ro,Sp	S,Ply	Fab	Fx	96⅝	GenSl31"	Bx	Ol	Wh	ST,Wl,Fab
180	12,000	64	1,240	25,000	15.50	10.20	3,440	5,600	50'6"	27'11"	8'6"	359.0	40.0	16.0	12.0	39.0	23.40	Ro,Sp	S,Ply	Fab	Fx	96⅝	GenSl31"	Bx	Ol	Wh	ST,Wl,Fab
215	*10,000*	*70*	*1,250*	*23,300*	*30.2*	*12.5*	*29,000*	*45,000*	*107'3"*	*74'4"*	*20'9½"*	*1,486.0*	.....	.....	.....	.....	.....	*D*	*D*	*AD*	*Re*	*315*	*Gr,Ha19x23*	*Gr,Dse,Hyd*	*Ol,Pn*	*Rw*	*D,Rs,AD*
175	10,000	70	650	14,000	28.75	17.2	48,545	82,500	152'	106'	27'7"	2,867	.....	.....	.....	.....	.....	D,S	D	AD,Fab	.....	.....	.....	.....	.....	.....	D,Rv,AD
185	6,000	63	1,250	22,000	20.4	9.65	8,000	14,000	71'	44'	10'	686.0	55.0	26.0	44.0	62.0	47.5	Rs,D	D	D	Re	126	Aut	Aut	Aer,Ol	Wh	D,Ru,D
206	6,000	65	1,092	22,000	23.4	12.4	19,360	33,500	95'7"	67'	13'10"	1,432.0	120.5	61.5	84.0	197.5	106.0	Rs,D	D	AD	Re	206.5	Aut 55x19	Aut	Aer,Ol	Wh	D
179	7,800	69	920	24,000	19.3	11.3	.....	27,000	104'	65'1¾"	19'8¾"	1,400.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
179	7,800	69	920	24,000	19.3	11.3	.....	27,000	104'	65'1¾"	17'11"	1,400.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
210	10,000	70	690	18,000	36.5	13.5	.....	65,000	115'	79'3"	25'4"	1,780.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
125	S.L.	50	1,100	20,000	12.3	12.5	2,875	4,550	41'8"	30'	9'7"	370.0	31.0	7.5	13.0	29.5	22.5	ST	DT	Fab	Fx	96	9.5x12 Lp	WarMech	PnHyd	Wh	Wl,ST,Me,Fab
210	*10,000*	*70*	*1,440*	*26,900*	*28.1*	[22]	*24,750*	[38]*38000*	*108'*	*75'*	*19'2"*	*1,353.0*	*91.8*	*70.1*	*54.0*	*146.6*	*99.5*	*D*	*D, AD*	*AD*	*Re*	*311*	*5x4 19x23:Go*	*Go,Hyd*	*Ol,Pn*	*Rw*	*D,Rs,Ad*
196	12,500	60	1,090	23,200	19.40	12.80	12,000	18,560	85'	62'	21'1"	939.0	87.0	23.0	43.0	42.0	58.6	Rv,AD	AD	AD	Re	216	Bx42x15.00	Bx	Bx	Wh	D,Rv,AD
196	.....	67	1,200	22,750	24.3	10.15	16,398	24,400	95'	64'6"	16'11"	987.0	102.8	37.9	46.7	94.5	83.4	Rv,AD	AD	AD	Re	222	Bx45x16.00-16	Pal	Bx	Wh	D,Rv,AD
191	.....	67	1,065	21,400	24.3	11.1	16,857	24,400	95'	64'6"	16'11"	987.0	102.5	37.9	46.7	94.5	83.4	Rv,AD	AD	AD	Re	.....	Bx45x17.00-16	Pal	Bx	Wh	D,Rv,AD
235	.....	*73.8*	*1,520*	*24,300*	*32.1*	*9.79*	*34,546*	*47,000*	*117'6"*	*92'3"*	*27'10"*	*1,462.0*	.....	.....	.....	.....	.....	.....	.....	.....	*Ty*	.....	.....	.....	.....	.....	.....	.....
202	.....	*65*	*1,585*	*23,700*	*24.2*	*9.1*	*13,674*	*20,000*	*78'*	*62'2"*	*19'10"*	*827.0*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
190	9,600	62	1,300	22,000	21.3	8.9	5,475	8,000	49'	38'4"	12'	375.0	22.5	26.7	21.0	44.8	31.2	D,Box	D	Me	Re	90¾	Ha 32x6	Ha,Hyd	Bx,Ol	Wh	D,Mo
190	9,600	64	1,000	21,150	22.91	13.15	6,450	10,500	55'	38'7"	10'1"	458.3	29.5	17.7	19.5	69.5	35.0	AD,Rv	AD	AD	Re	.....	Go 35x15-6	Go,Hyd	Aer	Wh	AD,Rv,AD
202	9,600	65	1,160	25,700	22.91	11.66	7,100	10,500	55'	38'7"	10'1"	458.3	29.5	17.7	19.5	69.5	35.0	AD,Rv	AD	AD	Re	.....	Go 35x15-6	Go,Hyd	Aer	Wh	AD,Rv,AD
212	9,600	65	1,360	22,300	23.8	10.82	5,960	8,650	49'6"	36'4"	9'11"	352.0	22.1	13.6	17.3	54.4	33.8	AD,Rv	AD	AD	Re	13'6"	Go 11.0x12	Gr,Pal	Aer	Wh	AD,Rv,AD
233	12,000	65	1,600	23,400	31.76	9.72	11,475	17,500	65'6"	49'9½"	11'10½"	551.0	35.0	29.3	34.8	93.6	40.4	A.D,Rs	AD	AD	Re	15'4"	Go42.31x15-6	Go,Hyd	Aer	Wh	A.D,Rs,AD
230	18,000	65	1,275	23,600	31.76	11.5	11,200	17,500	65'6"	49'9½"	11'10½"	551.0	35.0	29.3	34.8	93.6	40.4	A.D,Rs	AD	AD	Re	15'4"	Go42.31x15-6	Go,Hyd	Aer	Wh	A.D,Rs,AD
253	19,000	65	1,950	27,200	31.76	8.75	11,600	17,500	65'6"	49'9⅞"	11'10½"	551.0	35.0	29.3	34.8	93.6	40.4	A.D,Rs	AD	AD	Re	15'4"	Go42.31x15-6	Go,Hyd	Aer	Wh	A.D,Rs,AD
253	19,000	65	2,010	28,000	31.76	7.95	12,045	17,500	65'6"	49'9½"	11'10½"	551.0	35.0	29.3	34.8	93.6	40.4	A.D,Rs	AD	AD	Re	15'4"	Go42.31x15-6	Go,Hyd	Aer	Wh	A.D,Rs,AD
220	12,000	65	1,275	20,400	31.76	11.65	11,150	17,500	65'6"	49'9½"	11'10½"	551.0	35.0	29.3	34.8	93.6	40.4	A.D,Rs	AD	AD	Re	15'4"	Go42.31x15-6	Go,Hyd	Aer	Wh	A.D,Rs,AD
262	19,000	79	1,515	25,200	40.0	8.33	25,080	40,000	95'	73'1¾"	18'3"	1,000.0	66.2	94.6	55.6	239.7	48.4	A.D,Rs	AD	AD	Re	20'	Go[34]15x16x42	Go,Hyd	Aer	[35]	A.D,Rs,AD
244	18,000	78.5	1,160	22,400	37.50	10.40	24,217	37,500	95'	73'1¾"	18'3"	1,000.0	66.2	94.6	55.6	239.7	48.4	A.D,Rs	AD	AD	Re	20'	Go[34]15x16x22	Go,Hyd	Aer	[35]	A.D,Rs,AD
232	14,000	78.5	1,130	19,600	37.5	10.7	24,137	37,500	95'	73'1¾"	18'3"	1,000.0	66.2	94.6	55.6	239.7	48.4	A.D,Rs	AD	AD	Re	20'	[34]15x16x42	Go,Hyd	Aer	[35]	A.D,Rs,Ad
262	19,000	79	1,635	26,000	40.0	8.33	25,813	40,000	95'	73'1¾"	18'3"	1,000.0	66.2	94.6	55.6	239.7	48.4	A.D,Rs	AD	AD	Re	20'	[34]15x16x42	Go,Hyd	Aer	[35]	A.D,Rs,AD
130	10,000	70	557	17,000	22.0	15.6	24,611	52,000	130'	90'7"	24'7"	2,170.0	204.6	94.1	59.3	203.6	156.2	D	D	D	.....	.....	.....	.....	.....	.....	D,Rs,D
140	10,000	67	.....	.....	27.4	18.2	31,292	63,000	157'	91'10"	27'2¼" [38]	2,300.0	[37]	[37]	[38]	[38]		D	D	D	.....	.....	.....	.....	.....	.....	D,Rv,D
145	*10,000*	*71*	.....	.....	*30.40*	*17.1*	*33,356*	*70,000*	*157'*	*91'10"*	*27'2¼" [38]*	*2,300.0*	[37]	[37]	[38]	[38]		D	D	D	.....	.....	.....	.....	.....	.....	D,Rs,D
163	7,000	65	800	15,000	31.3	14.0	24,000	42,000	118'2"	68'	21'5"	1,340	103.7	64.0	62.0	146.0	79.4	D,Trs	D	D,Fab	.....	.....	.....	.....	.....	.....	D,Rv
166	7,000	65	1,000	19,000	25.0	13.0	12,900	19,500	86'	51'2"	17'8"	780.6	53.2	35.4	30.6	86.4	41.7	D,Box	D	D,Fab	Re	134	Ha,Aut,17x45	Hyd	Ol	Wh	D,Rv
166	7,000	65	1,000	19,000	25.64	13.33	13,100	20,000	86'	52'3"	17'8"	780.6	53.2	26.8	30.74	86.4	58.47	D,Box	D	D,Fab	Re	134	Ha,Aut,17x45	Hyd	Ol	Wh	D,Rv
175	*7,500*	*65*	*600*	*17,000*	*34.4*	*13.7*	*30,200*	*57,500*	*127'*	*79'3"*	*27'7¼"*	*1,670.0*	.....	.....	.....	.....	.....	*D,Trs*	*D*	*D,Fab*	.....	.....	.....	.....	.....	.....	*D,Rv*

Sk — Skid
Sl — Streamline
S.L. — Sea Level
Sh — Shinn
S.M.B. — Single metal box
Sol — Solid
Sp — Spruce
Spr — Spring
SS — Stainless Steel
Stu — Studebaker
Sz — Szekly
T — Tubing
Trs — Truss
Ty — Tricycle
W — Wood
War — Warner
Wel — Welch
Wh — Wheel
Wl — Welded
Wr — Wright
Ww — Whirlwind

Commercial Footnotes

1. All models available with open cockpits.
2. Minimum speed, power on, level flight. Restricted control, stall not possible.
3. Blade loading.
4. Blade area.
5. Goodyear 18x8-3 wheels and brakes optional.
6. Approved on floats.
7. Patent applied for on wing structure.
8. At full load Model 1050 climbs 1650 ft. per min.
9. Full load—modified flaps.
10. Metal covered to rear of cabin—fabric covered balance of fuselage.
11. CT-I Civilian Trainer also available with 125 h.p. Menasco—wood or adjustable pitch propeller.
12. Steerable wheel available.
13. May be equipped with Piper S-1000 skiis.
14. Radio installation available.
15. Hydraulic Brakes available on order.
16. Equipped with fixed wing slots.
17. Rubber discs.
18. Tripod.
19. All range figures with 15% reserve fuel.
20. Rm Ri.
21. Also as photographic plane or with floats or skiis.
22. Also available with 45 gallon and 52½ gallon capacity.
23. Also available with 21" streamlines or 22 x 10-4 wheels with hydraulic brakes.
24. Placarded V/L; actual high speed 169 MPH.
25. Also available with 160 gallon capacity.
26. Rear seat for 3-pass., Front 1 each.
27. With 2-position propeller.
28. 7.50 x 10 Front.
29. Available with skis.
30. Available with Edo floats.
31. Passenger seats.
32. Performance of twin-row Cyclon confidential.
33. Provisional gross weight.
34. Tricycle type landing gear.
35. Retractable shock-absorbin bumper.
36. On beeching gear.
37. Total vertical area 221 sq. ft.
38. Total horizontal area 358 sq. f
39. Navy model.
40. Also with P&W Engines.
41. Also 2-495.

Aviation's Military Ai

AVIATION does not assume resp

Military Manufacturer	Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	
		General				Power Plant							Performance							
Barkley-Grow Aircraft Corp	BT-2	Mil			4	2PWJ	800	5,000	150	740	46.5	102	220	5,000	207	10,000	64	1,350	19,50	2
Bell	BG-1	M1		CBL		WrCyR	755			860			206	11,500			71.7		24,95(	
Bellanca Aircraft Corp	28-90	Mil		OML	2	Pwww	950	6,500	150	800		126	280	6,500	250	6,500	68	2,800	30,000	
Bellanca Aircraft Corp	28-110	Mil		CML		Pwww	1,100						291							
Boeing Aircraft Co	B-299Y Flying Fortress	Mil		CML	7-9	4WrCy Ri,Rm	4,000	S.L.	1,700	2,500		138	268	14,000	220	10,000	70	1,400	29,300	2
Brewster Aeronautical Corp	138	Mil		CML	2	WrCy	750	15,200	136			108								
Brewster Aeronautical Corp	239	Mil		CML	1	WrCy	750					108								
Brewster Aeronautical Corp	339	Mil		CML	1	WrCy	800					123								
Consolidated Aircraft Corp	28 Military Amphibian	Mil		CMA		2Pwww	2,100	7,800		4,000			199	7,800	179	7,800	69	920	24,000	
Consolidated Aircraft Corp	28 Military Flying Boat	Mil		CMF																
Curtiss Aero. Div. Curtiss-Wright Corp	Hawk 75	Mil		CML	1	WrCyRi	840	S.L.	107	547	46.0	120	280	Crit	241	Crit	68	2,400	31,400	2
Curtiss Aero. Div. Curtiss-Wright Corp	Seagull	*Mil		OBL	2	PwwRi	550	S.L.	144	697	29.0	108	168	Crit	137	Crit	56	1,000	16,070	1
St Louis Airplane Div. Curtiss-Wright	Helldiver-77	Mil		CBL	2	PwwjRi	850													
St Louis Airplane Div. Curtiss-Wright	Hawk 75-A	Mil		CML	1	WrCyRi Pww	1,000	S.L.	161	677			302	Crit	260	Crit	68.1	1,100	33,140	2
St Louis Airplane Div. Curtiss-Wright	21 Interceptor	Mil		CML	1	WrCy	750	15,200	96	455	58.0	108	303	17,000	274	17,000	67	4,800	36,200	2
							850	6,000		530	44.7		286	7,500	246	7,500				
St. Louis Airplane Div. Curtiss Wright	21-B Interceptor	Mil		CML	1	WrCy	750	15,200	100	498	58.0	108	320	17,500	289	17,500	68	4,500	35,400	2
							850	6,000		589	44.7		303	7,500	263	7,500				
St. Louis Airplane Div. Curtiss-Wright	Falcon 22	Mil		CML	2	WrWW	420	1,400	68	518	25.6	99	215	2,500	195	2,500	58	1,870	25,900	1
St. Louis Airplane Div. Curtiss-Wright	23 Basic Combat	Mil		CML	2	Pww	550	5,000	100	692	3.22	102	254	5,500	223	5,500	71	1,860	27,900	2
Douglas Aircraft Co , Inc	Attack Bomber DB-7					2P&W														
Douglas Aircraft Co., Inc	Attack Bomber 8A-3N					P&W	1,050		250	910		120	260		205		66	1,430	29,600	2
Douglas Aircraft Co., Inc	Attack Bomber 8A-4					WrCy	1,000		252			126	255		200		65	1,570	29,800	2
Grumman Aircraft Engineering Corp	Utility J2F-1	Mil		CBA	2-4	WrCy	775	5,800	190	780	37.5	108	180	7,000	150	7,000	64	1,500	21,000	1
Grumman Aircraft Engineering Corp	G-36 Fighter & Bomber [1]	Mil		CML	1	Pwww	1,050	13,100	160	1,100	60	117	330	15,000	295	15,000	69.7	3,000	28,000	2
Grumman Aircraft Engineering Corp	G-37 Fighter & Bomber [2]	Mil		CBL	1	WrCy	750	15,200	130	900	40	108	270	17,000	224	12,000	67	3,000	32,000	1
Grumman Aircraft Engineering Corp	G-21B	Mil		CMA	8	2PwjRi	800	5,000	220	800	51.0	102	201	5,000	190	9,600	62	1,300	22,000	2
Hall Aluminum Aircraft Corp	PH-1 Mod-Overload	Mil		CBF	5	2WrCy	1,520	5,800	892	2,135	82.5	141	153.5	5,800	136.0	5,800	62.6	1,103	21,500	1
	PH-1 Mod-Normal								750	1,845			153.9		136.5		60.8	1,220	22,600	1
Hall Aluminum Aircraft Corp	PH-2 Overload	Mil		CBF	5	2WrCy	1,500	3,200	892	2,242	84.4	141	154.9	3,200	137.2	3,200	61.2	1,437	21,000	1
	PH-2 Normal								750	1,928			155.2		137.5		60.0	1,478	22,200	1
Kellett Autogiro Corp	KD-1A	Mil		OLGY	2	Ja	225	S.L.	30	205	14.0	102	125	S.L.	100	S.L.	No	1,060	14,000	4
Lockheed Aircraft Corp	Model 322-61	Mil		DCLM	1	2Aln	2,180	13,200	410	600	110	138	404	16,000	350	16,000	85.0	3,400	28,000	4
Lockheed Aircraft Corp	Model EB-14 Bomber	Mil		Mil	4	2WrCy	2,000	4,500	644	2,160	53.0	126	284	15,000	255	19,000	69	2,215	25,000	3
Glenn L. Martin Co	167-W	Mil		CML	3	2Pwww	2,100	7,500	510	2,470		132	310	14,000	248		62	7,790	31,500	2
Glenn L. Martin Co	166	Mil		CML	4	2Pwww	2,100	65,000	762	2,000		137	268	Best			70.0	1,800	25,0X	
North American Aviation, Inc	NA-25 (047-B)	Mil		CML	3	WrCyRi	750	17,000	134	705	40.8	132	244	18,000	212	13,000	67	1,750	29,500	2
North American Aviation, Inc	NA-16-1 (BT-14)	Mil		CML	2	WrWWRi	420	1,400	104	730	20.8	108	170	1,500	146	1,500	65	1,100	17,400	1
North American Aviation, Inc	NA-16-3 (BC-1A)	Mil		CML	2	PwwRi	550	5,000	111	805	23.5	108	206	5,000	185	12,000	67	1,300	22,000	2
North American Aviation, Inc	NA-44	Mil		CML	2	WrCyRi	745	9,600	120	734	36.4	108	250	11,500	223	16,500	71	1,900	25,500	2
North American Aviation, Inc	NA-50	Mil		CML	1	WrCyRi	840	8,700	120	670	41.3	108	270	10,700	235	13,000	70	2,440	31,500	2
North American Aviation, Inc	NA-35			CML	2	MenId	150	3,000	24	305	9.75	80	140	3,000	124	3,000	48	900	18,500	1
North American Aviation, Inc	NA-35			CML	2	RanId	175	S.L.	27	315	11.48	84	150	S.L.	135	3,000	50	1,350	19,500	1
North American Aviation, Inc	NA-40-A	Mil		CML	5	WrCyRi	2,550	12,000	900	1,728	133	150	310	13,500	256	11,000	84	1,880	26,000	3
Phillips Aviation Co	X-PT	Mil		CML	2	Ranger	165	S.L.	38		10.5	92	158	S.L.	139	5,000	46	920	17,400	2
Republic Aviation Corp [3]	U S Army Air Corps P35	Mil		CML	1	PwwwRi	850	8,000	160			10'6"								
Republic Aviation Corp	2PA-A Model 230	Mil		CMA	2	WrCyRi	850	5,800	[9] 130			9'0"	225	5,800						2
Republic Aviation Corp	EP-1 Model 100	Mil		CML	1	PwwwRi	1,100	9,000	[10] 130	750		10'6"	320		290			2,800	31,000	2
Republic Aviation Corp	2PA Model 200	Mil		CML	2	PwwwRi	1,100	9,000	[10] 130	675		10'6"	315		285			2,600	30,000	2
Ryan Aeronautical Co	S-T-M	Mil		OML	1-2	Men	150	3,000	24	326	10.0	80	142	3,000	128	3,000	42	975	18,600	1
Stearman Aircraft Co [11]	76D1	Mil		OLB	2	Pwj	320	S.L.	70	540		105	151	S.L.	132	S.L.	56	1,060	18,400	1
Stearman Aircraft Co [11]	76C3	Mil		OLB	2	WrWw	420	1,400	100	550		105	156	S.L.	136	S.L.	59	1,220	20,000	1
Stearman Aircraft Co [12]	73L3	Mil		OLB	2	Ly	225	S.L.	43	350		105	124	S.L.	107	S.L.	52	860	12,400	1
Stearman Aircraft Co [11]	76D3	Mil		OLB		PwjRi	400	5,000	100	635		105	157	5,000	135	5,000	56	1,410	23,600	1
Stearman Aircraft Co [11]	S76D1	Mil		OSB		Pwj	320	S.L.	70	478		105	135	S.L.	118	S.L.	58	840	15,000	1
Stearman Aircraft Co [12]	A75L3	Mil		OLB	2	Ly	225	S.L.	46	386		102	125	S.L.	103	S.L.	51	825	13,200	1
Vought-Sikorsky Div. United Aircraft	V-142	Mil		CBL	2	Pwwj	750	8,900	145			120	208	9,000	172	9,000	65	1,330	24,200	1
Vought-Sikorsky Div. United Aircraft	V-156	Mil		CML	2	Pwwj	750	9,000	130	701	30.3	132	257	11,000	227	10,000	60	1,545	28,200	2
Vought-Sikorsky Div. United Aircraft	OS2U-1		[13]	CM [14]	2	Pwj							Performance and technical information not re							
Vought-Sikorsky Div. United Aircraft	XSO2U-1		[13]	CM [14]	2	Ran							Performance and technical information not re							
Vought-Sikorsky Div. United Aircraft	XPBS-1	Mil		CMF									Performance and technical information not re							
Vultee Aircraft Inc	Valiant 51 [15]	Mil		CML	2	Pww	550	5,000	160	900		120	236	9,500	213	11,500	61		25,500	2
Vultee Aircraft Inc	Valiant 54	Mil		CML	2	Pwj	450	S.L.	120	600		108	170	S.L.	143	S.L.	54		21,000	2
Vultee Aircraft Inc	Vanguard 48A	Mil		CML	1	WrCy	1,600	1,500	240	750		138	356	14,000	309	14,500	83		31,500	2
Vultee Aircraft Inc	Vanguard 48C	Mil		CML	1	Pwww	1,200	4,900	240	580		138	358	15,600	316	18,000	72.9		34,300	2
Vultee Aircraft Inc	Vanguard 56A	Mil		CML	2	Pwww	1,200	4,900	240	570		138	339	17,000	290	16,000	77		32,400	2
Vultee Aircraft Inc	V-12 [15]	Mil		CML	3	Pwww	1,200	4,900	494	1,035		120	262	16,400	236	19,200	71		26,000	2
Vultee Aircraft Inc	V-11 [15]	Mil		CML	3	Pwww	1,200	4,900	494	1,040		132	251	15,000	222	17,500	69		26,500	2
Vultee Aircraft Inc	V-12A	Mil		CML	3	WrCy	1,600	1,500	494	1,020		144	287	13,000	248	12,000	71		30,000	2
Waco Aircraft Co	S2HD	Mil		CBL	2	PwjRi	400	5,000					175	S.L.	158					
Waco Aircraft Co	WHD	Mil		CBL	2	WrRi	420	1,400					180	S.L.	162					
Waco Aircraft Co	LPF-7	Mil		GBL	2	LyRi	220	S.L.	50	320	12.5		135	S.L.	105	S.L.	51	868	14,600	

1. Carries 2-100 pound bombs and 2 machine guns.
2. Carries 2-100 pound bombs and 4 machine guns.
3. Includes 37.6 square feet fuselage.
4. Blade loading.
5. Blade area.
6. Welded steel tube forward fuselage structure with removable metal side panels and semi-monocoque rear fuselage.
7. Areas aft of hing ahead of hinge line surface areas.
8. Former name: Corp.
9. Fuel load up to able.

Aviation's Military Aircraft Specifica

AVIATION does not assume responsibility for the figures given

General					Power Plant						Performance							Weights				Dimensions			Area (sq. ft.)				
Designation or Model No.	A.T.C. number	Price at factory, $	Type	Number of seats	Make of engine	Total rated h.p.	At altitude, ft.	Fuel capacity (gal.)	Normal range (mi.)	Fuel consumption at cruising speed (gal. per hr.)	Propeller diameter — (in.)	High speed (m.p.h.)	At altitude, ft.	Cruising speed (m.p.h.)	At altitude, ft.	Stalling speed (m.p.h.)	Climb at sea level (ft. per m.)	Service ceiling (ft.)	Wing loading (lb. per sq. ft.)	Power loading (lb. per h.p.)	Weight empty	Gross weight (lb.)	Span	Length overall	Height overall	Wing (including ailerons)	Ailerons (total)	Fin	Rudder	Stabilizer
T-2	Mil			4	2PWJ	800	5,000	150	740	46.5	102	220	5,000	207	10,000	64	1,350	19,50	25.7	11.3	6,277	9,090	50'8¾"	38'1"	9'7½"	354.0	20.52	14.2	20.6	42.
G-1	M I		CBL		WrCyR	755			860			206	11,500			71.7		24,95C			3,819	6,641	36'	28'9"		353.8				
-90	Mil		OML	2	Pwww	950	6,500	150	800		126	280	6,500	250	6,500	68	2,800	30,000			4,450		46'1¾"	26'6"	7'	279.0				
-110	Mil		CML		Pwww	1,100						291									4,775	8,454								
-299Y Flying Fortress	Mil		CML	7–9	4WrCy Ri,Rm	4,000	S.L.	1,700	2,500		138	268	14,000	220	10,000	70	1,400	29,300	26.1	11.25	26,143	45,470	103'9"	67'10"	15'4½"					
8	Mil		CML	2	WrCy	750	15,200	136			108												39'	27'10"	10'11"					
9	Mil		CML	1	WrCy	750					108												35'	26'1½"	12'					
9	Mil		CML	1	WrCy	800					123												35'	25'7½"	12'					
3 Military Amphibian	Mil		CMA		2Pwww	2,100	7,800		4,000			199	7,800	179	7,800	69	920	24,000	19.6	11.4		27,413	104'	65'1¾"	19'8⅞"	1400				
Military Flying Boat	Mil		CMF																										
awk 75	Mil		CML	1	WrCyRi	840	S.L.	107	547	46.0	120	280	Crit	241	Crit	68	2,400	31,400	21.9	6.16	3,984	5,172	37'4"	28'1"	9'4"	236.0				
eagull	*Mil		OBL	2	PwwRi	550	S.L.	144	697	29.0	108	168	Crit	137	Crit	56	1,000	16,070	15.2	9.44	3,543	5,192	36'	26'6"	13'7"	342.0				
elldiver-77	Mil		CBL	2	PwwjRi	850													Military Confi	dential			32'	27'10⅜"						
awk 75-A	Mil		CML	1	WrCyRi Pww	1,000	S.L.	161	677			302	Crit	260	Crit	68.1	1,100	33,140	24.1	7.59	4,483	5,692	37'4"	28'8"	9.25	236.0				
Interceptor	Mil		CML	1	WrCy	750	15,200	96	455	58.0	108	303	17,000	274	17,000	67	4,800	36,200	25.2	4.75	3,148	4,180	35'	26'4"	8'8"	174.3	11.90	8.06	7.36	16.9
						850	6,000		530	44.7		286	7,500	246	7,500														
-B Interceptor	Mil		CML	1	WrCy	750	15,200	100	498	58.0	108	320	17,500	289	17,500	68	4,500	35,400	24.9	4.94	3,210	4,350	35'	26'4"	8'8"	174.3	11.90	8.06	7.36	16.9
						850	6,000		589	44.7		303	7,500	263	7,500														
aleon 22	Mil		CML	2	WrWW	420	1,400	68	518	25.6	99	215	2,500	195	2,500	58	1,870	25,900	18.4	7.62	2,307	3,200	35'	26'6"	7'6"	174.3	11.90	8.06	7.36	16.9
3 Basic Combat	Mil		CML	2	Pww	550	5,000	100	692	3.22	102	254	5,500	223	5,500	71	1,860	27,900	25.9	8.16	3,158	4,500	35'	27'2"	8'11½"	174.3	11.90	8.06	7.36	16.9
ttack Bomber DB-7					2P&W																		61'4"	15'10"						
ttack Bomber 8A-3N					P&W	1,050		250	910		120	260		205		66	1,430	29,600	21.6	7.5	5,508		47'8¾"	47' 32'5"	9'9"	363.0				
ttack Bomber 8A-4					WrCy	1,000		252			126	255		200		65	1,570	29,800	20.6	7.5	5,370	7,500	47'8¾"	32'6"	9'9"	363.0				
tility J2F-1	Mil		CBA	2–4	WrCy	775	5,800	190	780	37.5	108	180	7,000	150	7,000	64	1,500	21,000	15.1	8.0	4,300	6,120	39'	34'	12'4"	409	32.0	14.2	10.6	32.1
-36 Fighter & Bomber[1]	Mil		CML	1	Pwww	1,050	13,100	160	1,100	60	117	330	15,000	295	15,000	69.7	3,000	28,000	24.6	6.1	4,715	6,398	38'	28'10"	9'2½"	260[8]	11.48	13.2	9.38	30.4
-37 Fighter & Bomber[2]	Mil		CBL	1	WrCy	750	15,200	130	900	40	108	270	17,000	224	12,000	67	3,000	32,000	17.7	5.4	3,250	4,620	32'	23'	8'9"	260.0	11.5	6.9	7.8	19.8
-21B	Mil		CMA	8	2PwjRi	800	5,000	220	800	51.0	102	201	5,000	190	9,600	62	1,300	22,000	21.3	8.9	5,425	8,000	49'	38'4"	12'	375.0	22.5	26.7	21.0	44.8
H-1 Mod-Overload	Mil		CBF	5	2WrCy	1,520	5,800	892	2,135	82.5	141	153.5	5,800	136.0	5,800	62.6	1,103	21,500	14.7	11.3	9,320	17,173	72'10"	51'10"	17'6"	1170	70.6	47.3	45.0	126.7
H-1 Mod-Normal								750	1,845			153.9		136.5		60.8	1,220	22,600	13.9	10.7		16,250								
H-2 Overload	Mil		CBF	5	2WrCy	1,500	3,200	892	2,242	84.4	141	154.9	3,200	137.2	3,200	61.2	1,437	21,000	14.1	11.0		16,457	72'10"	51'0"	17'11"	1170	70.6	47.3	45.0	126.7
H-2 Normal								750	1,928			155.2		137.5		60.0	1,478	22,200	13.3	10.4	9,275	15,545								
D-1A	Mil		OLGY	2	Ja	225	S.L.	30	205	14.0	102	125	S.L.	100	S.L.	No	1,060	14,000	40.6[4]	9.98	1,600	2,245	40'	28'10"	10'3"	55.2[5]		12.0	3.2	22.0
Model 322-61	Mil		DCLM	1	2Aln	2,180	13,200	410	600	110	138	404	16,000	350	16,000	85.0	3,400	28,000	41.2	6.2	11,171	13,500	52'	37'9⅛"	9'10¼"	327.5	24.48	27.42	21.36	54.0
Model EB-14 Bomber	Mil		Mil	4	2WrCy	2,000	4,500	644	2,160	53.0	126	284	15,000	255	19,000	69	2,215	25,000	33.6	9.25	12,650	18,500	65'6"	44'4"	11'10½"	551	35.0	29.3	34.8	93.6
67-W	Mil		CML	3	2Pwww	2,100	7,500	510	2,470		132	310	14,000	248		67	7,790	31,500	28.4	7.2	10,586	15,297	61'4"	46'8"	10'	538.5	47.5	18.87	23.89	73.5
96	Mil		CML	4	2Pwww	2,100	65,000	762	2,000		137	268	Best			70.0	1,800	25,00x			11,300	16,100	70'6"	44'9"	11'6"	682	52.4	20.5	22.9	56.7
A-25 (047-B)	Mil		CML	3	WrCyRi	750	17,000	134	705	40.8	132	244	18,000	212	13,000	67	1,750	29,500	22.25	7.77	6,002	7,700	46'3⅝"	33'2⅞"	12'1⅝"	348.60	32.36	11.36	22.65	35.7
A-16-1 (BT-14)	Mil		CML	2	WrWWRi	420	1,400	104	730	20.8	108	170	1,500	146	1,500	65	1,100	17,400	17.76	10.41	3,247	4,375	41'¼"	28'5"	8'10½"	246.22	22.80	5.33	13.35	28.3
A-16-3 (BC-1A)	Mil		CML	2	PwwRi	550	5,000	111	805	23.5	108	206	5,000	185	12,000	67	1,300	22,000	20.65	9.70	4,110	5,340	42'7¼"	29'	9'1"	258.10	22.80	5.33	13.21	28.3
A-44	Mil		CML	2	WrCyRi	745	9,600	120	734	36.4	108	250	11,500	223	16,500	71	1,900	25,500	23.95	8.26	4,570	6,155	42'7¼"	28'10"	9'1"	258.10	22.80	5.33	13.21	28.3
A-50	Mil		CML	1	WrCyRi	840	8,700	120	670	41.3	108	270	10,700	235	13,000	70	2,440	31,500	23.50	6.37	4,120	5,350	37'5"	27'8"	8'10½"	227.51	18.74	5.33	13.21	27.9
A-35			CML	2	MenId	150	3,000	24	305	9.75	80	140	3,000	124	3,000	48	900	18,500	11.89	11.73	1,218	1,760	29'8⅞"	25'6"	9'4"	148.0	12.40	5.0	8.0	16.0
A-35			CML	2	RanId	175	S.L.	27	315	11.48	84	150	S.L.	135	3,000	50	1,350	19,500	12.70	10.75	1,319	1,880	29'8⅞"	25'10½"	9'4"	148.0	12.40	5.0	8.0	16.0
A-40-A	Mil		CML	5	WrCyRi	2,550	12,000	900	1,728	133	150	310	13,500	256	11,000	84	1,880	26,000	39.35	7.50	16,003	24,000	67'6"	51'5"	16'1½"	610.1	32.3[7]	37.2	33.8[7]	92.0
-PT	Mil		CML	2	Ranger	165	S.L.	38		10.5	92	158	S.L.	139	5,000	46	920	17,400			1,690	2,500	36'2"	23'6"	7'8"	195				
S Army Air Corps P35	Mil		CML	1	PwwwRi	850	8,000	160			10'6"								25.2	6.5	4,279	5,563	36'	25'4"	9'9½"	220.0	19.3	10.0	9.5	18.9
A-A Model 230	Mil		CMA	2	WrCyRi	850	5,800	[9] 130			9'0"	225	5,800						26.0	7.65		6,500	41'	30'4"	14'4"	250.0	22.0	11.1	10.2	23.3
P-1 Model 100	Mil		CML	1	PwwwRi	1,100	9,000	[10] 130	750		10'6"	320		290			2,800	31,000	25.5	5.21	4,411	5,731	36'	26'10"	9'9½"	225.0	19.3	10.0	9.5	18.9
A Model 200	Mil		CML	2	PwwwRi	1,100	9,000	[10] 130	675		10'6"	315		285			2,600	30,000	26.8	5.48	4,445	6,022	36'	26'10"	9'9½"	225.0	19.3	10.0	9.5	18.9
T-M	Mil		OML	1–2	Men	150	3,000	24	326	10.0	80	142	3,000	128	3,000	42	975	18,600	12.9	10.7	1,083	1,600	29'11"	21'5⅜"	6'11"	124.0	12.0	4.7	7.2	12.0
5D1	Mil		OLB	2	Pwj	320	S.L.	70	540		105	151	S.L.	132	S.L.	56	1,060	18,400	10.9	10.1	2,371	3,240	32'2"	24'5"	9'2"	297.4	18.74	3.14	11.83	21.5
3C3	Mil		OLB	2	WrWw	420	1,400	100	550		105	156	S.L.	136	S.L.	59	1,220	20,000	11.9	8.4	2,561	3,530	32'2"	24'3"	9'2"	297.4	18.74	3.14	11.83	21.5
3L3	Mil		OLB	2	Ly	225	S.L.	43	350		105	124	S.L.	107	S.L.	52	860	12,400	9.0	12.0	2,005	2,690	32'2"	25'¼"	9'2"	297.4	23.1	3.14	11.83	21.5
6D3	Mil		OLB		PwjRi	400	5,000	100	635		105	157	5,000	135	5,000	56	1,410	23,600	10.92	8.125	2,435	3,250	32'2"	25'¼"	9'2"	297.4	18.74	3.14	11.83	21.5
76D1	Mil		OSB		Pwj	320	S.L.	70	478		105	135	S.L.	118	S.L.	58	840	15,000	11.87	11.0	2,459	3,533	32'2"	27'9⅞"	11'3"	297.4	18.74	3.14	11.83	21.5
75L3	Mil		OLB	2	Ly	225	S.L.	46	386		102	125	S.L.	103	S.L.	51	825	13,200	9.2	11.9	1,977	2,686	32'2"	24'11½"	9'4½"	297.6	23.78	3.14	11.83	21.1
-142	Mil		CBL	2	Pwwj	750	8,900	145			120	208	9,000	172	9,000	65	1,330	24,200	16.68	7.28	3,550	5,445	33'3"	27'9⅜"	10'	327.0	26.5	6.74	13.35	26.6
-156	Mil		CML	2	Pwwj	750	9,000	130	701	30.3	132	257	11,000	227	10,000	60	1,545	28,200	21.3	8.7	4,500	6,500	42'	33'11¾"	9'9½"	305.3	27.6	10.62	11.45	23.7
S2U-1			CM[14]	2	Pwj							Performance and technical information not released																		
SO2U-1			CM[14]	2	Ran							Performance and technical information not released																		
PBS-1	Mil		CMF									Performance and technical information not released																		
aliant 51[16]	Mil		CML	2	Pww	550	5,000	160	900		120	236	9,500	213	11,500	61		25,500	23.6	10.2	4,193	5,628	42'	29'2.3"	9'6"	238.1	18.9	6.3	8.9	22.9
aliant 54	Mil		CML	2	Pwj	450	S.L.	120	600		108	170	S.L.	143	S.L.	54		21,000	17.1	9.0	3,054	4,069	42'	28'7"		238.6	18.9	7.12	8.82	30.7
anguard 48A	Mil		CML	1	WrCy	1,600	1,500	240	750		138	356	14,000	309	14,500	83		31,500	37.1	4.56	5,623	7,298	36'	29'2"	13'5⅜"	196.7	16.9	6.05	9.15	22.9
anguard 48C	Mil		CML	1	Pwww	1,200	4,900	240	580		138	358	15,600	316	18,000	72.9		34,300	30.6	5.0	4,657	6,029	36'	27'10"	13'6"	196.7	16.9	6.05	9.15	22.9
anguard 56A	Mil		CML	2	Pwww	1,200	4,900	240	570		138	339	17,000	290	16,000	77		32,400	33.0	5.3	4,815	6,305	36'	26'5"		197.0	17.0	6.08	9.12	22.9
-12[15]	Mil		CML	3	Pwww	1,200	4,900	494	1,035		120	262	16,400	236	19,200	71		26,000	26.9	8.6	6,714	10,344	50'	38.052'	13.008'	384.0	22.7	9.1	14.4	49.6
11[15]	Mil		CML	3	Pwww	1,200	4,900	494	1,040		132	251	15,000	222	17,500	69		26,500	25.8	9.0	6,550	9,887	50'	37.5'	12.95'	384.0	22.7	6.15	16.55	49.6
12A	Mil		CML	3	WrCy	1,600	1,500	494	1,020		144	287	13,000	248	12,000	71		30,000	27.2	6.5	7,140	10,432	50'	38'7"	11'3"	384.0	22.7	6.15	16.55	49.6
HD	Mil		CBL	2	PwjRi	400	5,000					175	S.L.	158					14.25	9.47		3,800	32'8⅝"	25'6½"		256.3				
HD	Mil		CBL	2	WrRi	420	1,400					180	S.L.	162					14.25	9.02		3,800	32'8⅝"	25'6½"		256.3				
F-7	Mil		GBL	2	LyRi	220	S.L.	50	320	12.5		135	S.L.	105	S.L.	51	868	14,600	10.85	12.06	2,593	2,650	30'	23'1"	8'6"	243.6				

1. Carries 2-100 pound bombs and 2 machine guns.
2. Carries 2-100 pound bombs and 4 machine guns.
3. Includes 37.6 square feet fuselage.
4. Blade loading.
5. Blade area.
6. Welded steel tube forward fuselage structure with removable metal side panels and semi-monocoque rear fuselage.
7. Areas aft of hinge line only, areas ahead of hinge line included in fixed surface areas.
8. Former name: Seversky Aircraft Corp.
9. Fuel load up to 350 gallons available.
10. Fuel load up to 480 gallons available.
11. Available in range 320-420 HP with variable military equipment which may modify weights and performance.

ifications

Area (sq. ft.)					Wings			Landing Gear							Fuselage or Hull†
Ailerons (total)	Fin	Rudder	Stabilizer	Elevators (total)	Spars	Ribs	Covering material	Type	Tread (in.)	Wheel type and size	Brakes (type and make)	Landing gear shock unit (type and make)	Tail unit		
20.52	14.2	20.6	42.64	31.33	D	D	D	Re	168	Ha33,TypeII	Ha,Hyd	Aer	Wh		D,Rv,Mo
.....	.....	.....	.....	.....	Lam,Sp	Ply	Fab	Re	178	Bx32x6	Bx	Ol	Wh		ST,Wl,Fab
.....	.....	.....	.....	.....	D	D	AD	Re	.....	.....	Hyd	Ol,Pn	Rw		D,Rv,AD
.....	.....	.....	.....	.....	3.M.B.	Al, Tr	Al,Fab	Re	.....	27Sl	Hyd	Ol,Pn	.....		Mo
.....	.....	.....	.....	.....	3.M.B.	Al, Tr	Al	Re	.....	27Sl	Hyd	Ol,Pn	.....		Mo
.....	.....	.....	.....	.....	3.M.B.	Al, Tr	Al	Re	.....	27Sl	Hyd	Ol,Pn	.....		Mo
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....		Mo
.....	.....	.....	.....	.....	Me	Me	Me	Fx	.....	27″	Bx	Ol	Wh		Me
.....	.....	.....	.....	.....	Me	Me	Fab	Fx	.....	8½x10″	Bx	Ol	Wh		ST,Wl,Fab
.....	.....	.....	.....	.....	Me	Me	Me& Fab	Re	86¾	.....	Bx	Ol	Wh		AD,Me,Rv
.....	.....	.....	.....	.....	Me	Me	Me	Re	8.07	27″x6 ply	Bx	Ol	Wh		Me20
11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Re	83	7.50x10 Go	Go,Hyd	Ol,Pn	Wh		D,Rv,AD
11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Re	83	7.50x10 Go	Go,Hyd	Ol,Pn	Wh		D,Rv,AD
11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Re	83	7.50x10 Go	Go,Hyd	Ol,Pn	Wh		D,Rv,AD
11.90	8.06	7.36	16.98	8.58	AD	AD	AD	Re	107	27″ Go	Go,Hyd	Ol,Pn	Wh		D,Rv,AD
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	—		.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	—		.....
32.0	14.2	10.6	32.1	24.6	D	D	Fab	Re	90	30x7	Hyd	Bx,Ol	Wh		D,Mo
11.48	13.2	9.38	30.43	18.6	D	D	Me	Re	.....	Ha 26x6	Ha,Hyd	Bx,Ol	Wh		D,Mo
11.5	6.9	7.8	19.8	10.8	D	D	Fab	Re	72	Ha 26x6	Ha,Hyd	Bx,Ol	Wh		D,Mo
22.5	26.7	21.0	44.8	31.2	D,Box	D	Me	Re	90⅜	Bx32x6	Bx,Hyd	Bx,Ol	Wh		D,Mo
70.6	47.3	45.0	126.7	79.8	DTrs	D Trs	Fab	.....	.....	.....	.....	.....	.....		D,Rv,D
70.6	47.3	45.0	126.7	79.8	DTrs	D Trs	Fab	.....	.....	.....	.....	.....	.....		D,Rv,D
.....	12.0	3.2	22.0	.....	ST	Ply	Pl,Fab	Fx	114.5	7.00x5 Gr	Mech,Ha	Ol,Bx	Wh		ST,Wl,Fab
24.48	27.42	21.36	54.0	24.5	AD,Rv	Ply	Pl,Fab	Re	16′6″	36″Di&27″Di	Mech,Ha	Ol,Bx	s		ST,Wl,Fab
35.0	29.3	34.8	93.6	40.4	AD,Rv	AD	AD	Re	15′4″	Go 42.31x15.6	Go,Hyd	Aer	Wh		AD,Rv,AD
47.5	18.87	23.89	73.56	42.6	D	D	D	Re	195	39″ S.Cont.	Hyd	Ol	Wh		D,Rv
52.4	20.5	22.9	56.7	41.1	D	D	D	Re	192	45″Sl	Hyd	Ol	Wh		D,Rv,D
32.36	11.36	22.65	35.74	29.76	D	D	AD	Re	114	33″ S.C.	Hyd	Aer	Wh		D,Mo,AD
22.80	5.33	13.35	28.34	21.76	D	D	AD	Fx	95	27″ S.C.	Hyd	Aer	Wh		■
22.80	5.33	13.21	28.34	21.76	D	D	AD	Re	115½	27″ S.C.	Hyd	Aer	Wh		■
22.80	5.33	13.21	28.34	21.76	D	D	AD	Re	115½	30″ S.C.	Hyd	Aer	Wh		■
18.74	5.33	13.21	27.95	21.77	D	D	AD	Re	115½	30″ S.C.	Hyd.	Aer	Wh		■
12.40	5.0	8.0	16.0	13.0	D	D	AD	Fx	100	18″ Air Wheel	Mech.orHy	Aer	Wh		D,Mo,AD
12.40	5.0	8.0	16.0	13.0	D	D	AD	Fx	100	18″ Air Wheel	Mech.orHy	Aer	Wh		D,Mo,AD
32.3[7]	37.2	33.8[7]	92.0	46.0[7]	D	D	AD	Re	232	47″ S.C.	Hyd	Aer	Wh		D,Mo,AD
.....	.....	.....	.....	.....	AD	AD	AD	Fx	89	Aut 6.50x10	Toe,Hyd	Air,Ki	Pn		Stiff Skin
19.3	10.0	9.5	18.9	16.2	D	D	AD	Re	7′10″	27″	Hyd	Ol	Ol		.....
22.0	11.1	10.2	23.3	20.7	D	D	AD	A	7′10″	27″ SmContr	Hyd	Ol	Re		.....
19.3	10.0	9.5	18.9	16.2	D	D	AD	Re	7′10″	27″ SmContr	Hyd	Ol	Ol		Re
19.3	10.0	9.5	18.9	16.2	D	D	AD	Re	7′10″	27″ SmContr	Hyd	Ol	Ol		Re
12.0	4.7	7.2	12.0	10.0	Sol,Sp	D	Fab	Fx	66	Go 18x8-3	Go,Mech	Ol	Wh		D,Mo
18.74	3.14	11.83	21.5	14.14	Sol,Sp	Sp	Fab	Fx	.....	S124″	Hyd	Ol	Wh		ST,Wl,Fab
18.74	3.14	11.83	21.5	14.14	Sol,Sp	Sp	Fab	Fx	.....	S124″	Hyd	Ol	Wh		ST,Wl,Fab
23.1	3.14	11.83	21.5	14.14	Sol,Sp	Sp	Fab	Fx	.....	S124″	Hyd	Ol	Wh		ST,Wl,Fab
18.74	3.14	11.83	21.5	14.14	Sol,Sp	Sp	Fab	Fx	.....	S124″	Hyd	Ol	Wh		ST,Wl,Fab
18.74	3.14	11.83	21.5	14.14	Sol,Sp	Sp	Fab	Edo	.....	(Twin Floats)	.....	.....	.....		ST,Wl,Fab
23.78	3.14	11.83	21.16	14.14	Sol,Sp	Sp	Fab	Fx	77½	S124″	Hyd	Ol	Wh		ST,Wl,Fab
26.5	6.74	13.35	26.6	18.18	D,I	D	Fab	Fx	72	BxSl27″	Bx,Hyd	Ol	Wh		ST,Wl,Fab
27.6	10.62	11.45	23.72	16.44	D,SM,B	D	D,Fab	Re	120½	Bx30x7	Bx,Hyd	Ol	Wh		ST,Wl,Fab
18.9	6.3	8.9	22.95	19.0	.....	.....	AD	Re	136.7	.....	.....	.....	Fx		ST,Mo
18.9	7.12	8.82	30.7	20.7	.....	.....	AD	Fx	125.8	.....	.....	.....	Fx		ST,Mo
16.9	6.05	9.15	22.95	16.0	.....	.....	AD	Re	161 1/16	.....	.....	.....	Re		ST,Mo
16.9	6.05	9.15	22.95	16.0	.....	.....	AD	Re	161 1/16	.....	.....	.....	Re		ST,Mo
17.0	6.08	9.12	22.95	16.0	.....	.....	AD	Re	161 1/16	.....	.....	.....	Re		ST,Mo
22.7	9.1	14.4	49.6	32.8	.....	.....	AD	Re	144 5/16	.....	.....	.....	Re		Semi Mo
22.7	6.15	16.55	49.6	32.8	.....	.....	AD	Re	144 5/16	.....	.....	.....	Re		Semi Mo
22.7	6.15	16.55	49.6	32.8	.....	.....	AD	Re	144 5/16	.....	.....	.....	Re		Semi Mo
.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	85¼	8.50x10	Ha,Mech	Waco,Ol	Wh		.....
.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	85¼	8.50x10	Ha,Mech	Waco,Ol	Wh		.....
.....	.....	.....	.....	.....	Sp	Sp	Fab	.....	101	8.50x10	Ha,Hyd	Waco,Ol	Wh		.....

allons avail-
20-420 HP
ment which
formance.

12. Available in range 225-320 HP. Not available with radio, armament provisions of photographic equipment.
13. Navy model.
14. Convertible.
15. Photographs for Vanguard 56-A not released.

SIKORSKY XPBS-1

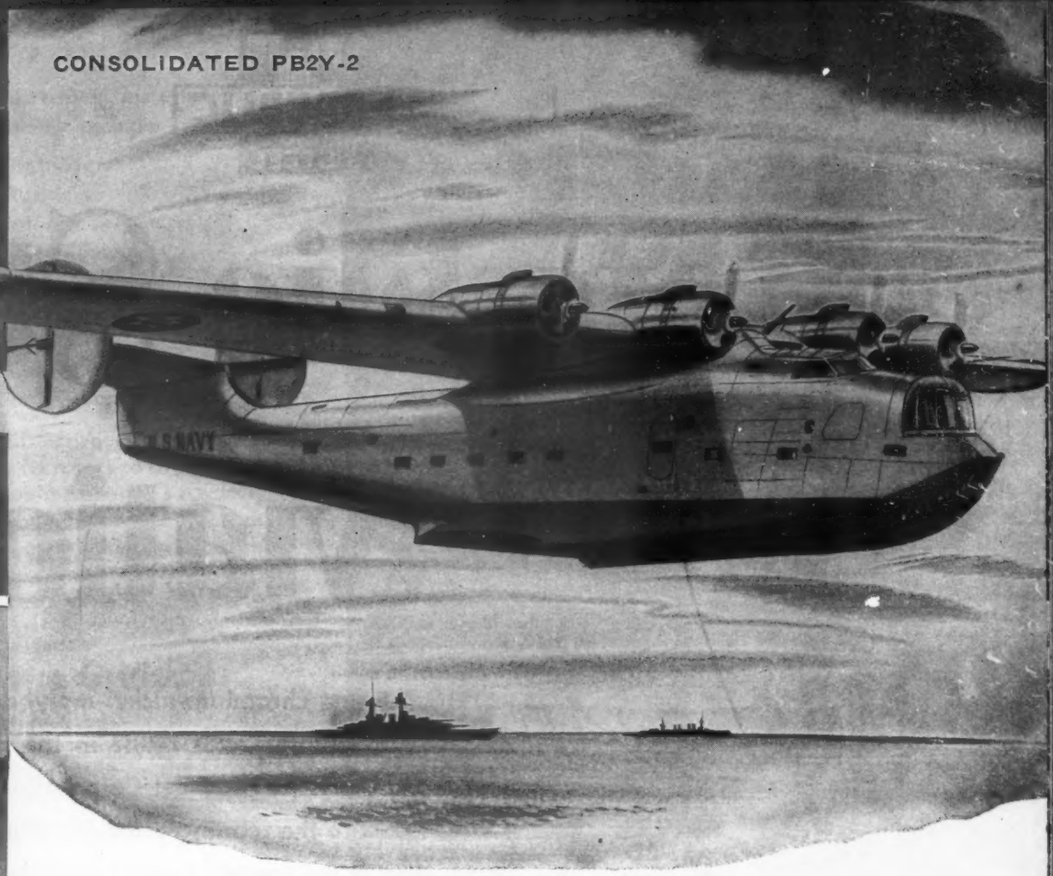
BREWSTER F2A-2

GRUMMAN F4F-3

MARTIN PBM-1

CONSOLIDATED P2Y-3

CONSOLIDATED PBY-2



CONSOLIDATED PB2Y-2

CURTISS ELECTRICS ON PATROL *with the* NAVY

The U. S. Navy, "First with Feathering" in 1934, when it equipped its Consolidated P2Y-3 Patrol Planes with Curtiss Electric Propellers, is again First in developing, with Curtiss engineers, the Reverse-pitch Propeller to provide its giant seaplanes with water-maneuverability hitherto unparalleled. Another degree of utility has thus been added to the outstanding four-engined Consolidated Patrol Bomber.

The adaptability of Curtiss Electrics has also led to their selection for the Navy's newest fast fighters in which air-maneuverability and high performance are paramount.

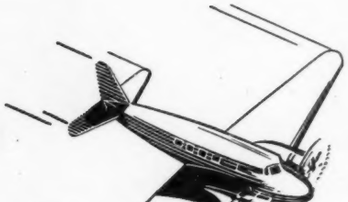
CURTISS WRIGHT CORPORATION

CURTISS PROPELLER DIVISION

REG. U. S. PAT. OFF.

REPUBLIC STEEL

Republic Steels *for* Aviation



In 1916, the first chromium-nickel-molybdenum crankshaft steel for use in Liberty motors was made in the plant of United Steel Co., now a part of Republic Steel Corporation. Today, Republic is supplying steels to the leading manufacturers of aircraft, engines and parts—and is the world's largest producer of quality aircraft steels.

THE ECONOMIC SELECTION of steel for any aviation need requires a study of the specific application. Research has developed so many new steels and the uses of steel in aviation service are so varied that no definite recommendations will be attempted here. However, a glance over the uses to which Republic steels have been applied in aviation will convey an idea of the manner in which this company, its divisions and subsidiaries are serving this fast-growing industry.

All Republic steels are made from ore taken from Republic ore mines, smelted in Republic blast furnaces and processed to the final forms in Republic plants. One responsibility carries through every operation—and every operation is continually subjected to test and inspection.

Republic aircraft steels are the result of years of experience in producing high quality steels for special purposes. After a heat of aircraft steel is poured, it is followed carefully through all operations. Complete identification is kept throughout, so that at all times any piece can be identified. Tests are selected from predetermined positions in the heat. These are examined by both the mill and laboratory metallurgists and must meet Republic's standards before being released for shipment. Through years of experience and constant research, Republic Steel Corporation has been able to produce aircraft steels which are satisfactorily meeting today's rigid requirements.

Republic Alloy Steels

Republic Alloy Steels have been used for years in aviation and have made a reputation for quality in:

Crankshafts	Cam Rings	Crank Cases
Master Rods	Piston Pins	Rollers
Link Rods	Gears	Reduction Gears
Propeller Shafts	Retainer Rings	Reduction Pinions
Cylinder Sleeves	Shafts	Fixed Reduction Gear
		Fittings

PROPELLER PARTS

Hubs	Half Barrels	Control Pistons
Blades	Control Brackets	Control Gears

Steels for these purposes must be "tailor-made" to a greater degree than for any other industry. Close cooperation must exist between the manufacturer, forge shop and steel producer to insure satisfactory quality. Knowing the physical properties required and the processing equipment available, Republic will work with you in the selection of the most suitable steel for any purpose—or develop a steel to meet your special requirements.

**ENDURO Stainless and Heat-Resisting Steels*

The present wide-spread use of the many alloy steel combinations under the stainless and heat-resisting classifications is a definite answer to the question, "Is aviation ready

WORLD'S LARGEST PRODUCER OF QUALITY STEELS

or stainless?" The parts for which these materials are being used with increasing frequency include:

Exhaust Stacks	**Stabilizers**
Manifolds	**Rudders**
Collector Rings	**Interior Trim**
Heaters	**Hose Clamps**
Diaphragms	**Wing Construction**
Pontoon Construction	**Wing Covering**
Tail Units	**Elevators**
Fuel Tanks	**Cables**

Anchors—Bolts—Nuts—Rivets—Turnbuckles

Here, again, a close study of the intimate details of service is necessary to the selection of the correct type of stainless or heat-resisting steel. And here again Republic's research and experience can be turned to the advantage of makers of aircraft, engines and parts requiring steel with high tensile strength, resistance to corrosion or the ability to withstand high temperatures without melting or burning or loss of strength.

Products of Republic Divisions and Subsidiaries

Cold drawn bars and special sections made by the Union Drawn Steel Division are widely used by the aviation industry for the manufacture of parts for engines, planes and instruments.

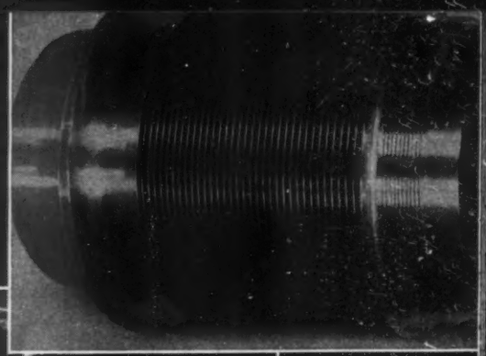
Parts bins, filing cabinets, lockers and shelving are manufactured by the Berger Manufacturing Division—to save time and materials in the industry's manufacturing plants, service hangars and airport buildings.

Tubing manufactured by Steel and Tubes Division, meets U. S. Army Specification No. 57-180-4 and U. S. Navy Specification No. 44-T-26b, both covering welded chrome-nickel, corrosion- and heat-resistant tubing for fabrication into exhaust stacks. Other types of tubing include stainless steel for flash heaters for cabins, streamline section tubing for wing struts, rail carbon tubing and conduit suitable for airport installations.

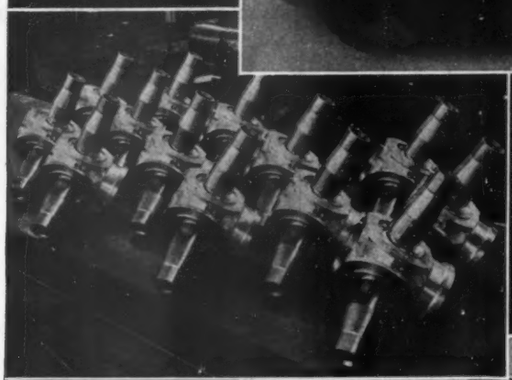
Truscon Steel Company, the world's largest manufacturer of steel building products, serves the aviation industry with a wide range of manufactured products, including standard steel buildings which can be erected in a few weeks' time, steel doors, steel windows, open truss and Clerespan steel joists, metal lath, Ferrobord steel roof-deck, structural steel, reinforcing bars, pressed steel inserts, concrete highway reinforcing products for hangar floor, apron and runway construction, and boxes and platforms for materials handling.

Republic Upson Quality headed and threaded products comprise a line of more than 20,000 items, including standard and special bolts, nuts, rivets, pins, turnbuckles, wire rope clips and similar items in carbon, alloy and stainless analyses—many of them in everyday use in the aviation industry.

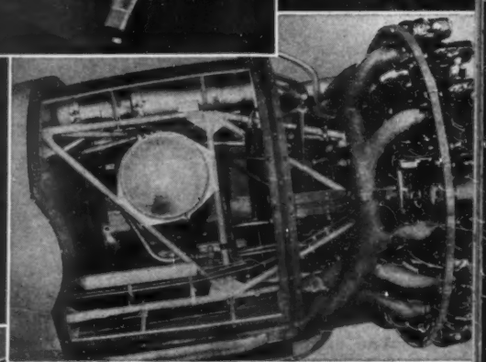
All the resources of Republic Steel Corporation, as well as its extensive research facilities and the experience of its staff of metallurgists, are available to manufacturers of aircraft, engines and parts, to airlines interested in field development and to independent fixed base operators interested in building or field construction. Address your inquiry to Republic Steel Corporation, Republic Bldg., Cleveland, O.



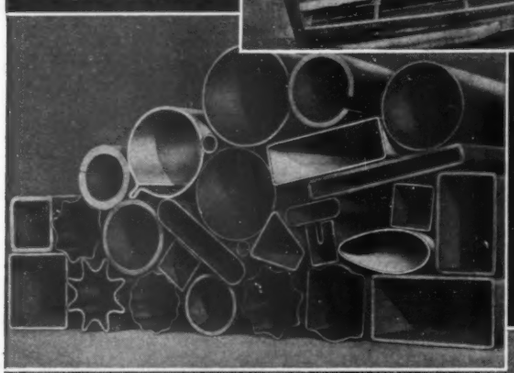
Aircraft engine cylinder sleeve made from Republic Nitralloy steel.



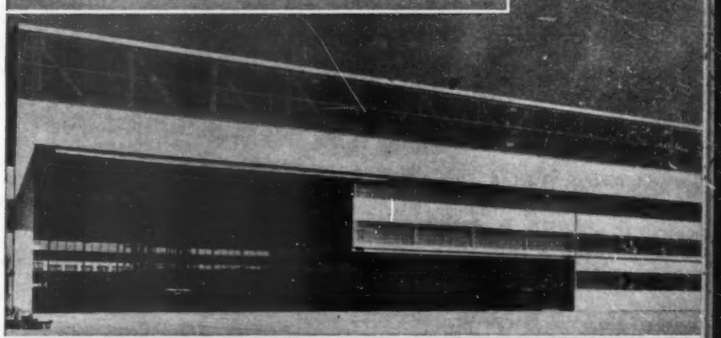
Three-way propeller spiders made from Republic chromium-nickel-molybdenum steel.



Republic alloy steels are extensively used for engine parts. Republic ENDURO heat-resisting steel is shown in the manifold and collector ring of this engine.



End sections of a few of the many standard and special shapes available in Republic "Electrunite" tubing



Truscon Series 3 canopy lift door on the plant of The Glenn L. Martin Co., Baltimore. This is the largest door of its type in the world, 300' wide by 43' 3" high. Each unit can be operated independently of or simultaneously with each or both of the other units. The entire door can be opened or closed in 59 seconds

BERGER MANUFACTURING DIVISION • NILES STEEL PRODUCTS DIVISION • STEEL AND TUBES DIVISION • UNION DRAWN STEEL DIVISION • TRUSCON STEEL COMPANY

Reg. U. S. Pat. Off.

REPUBLIC STEEL

ALPHABETICAL DIRECTORY OF PERSONNEL

Company names in Classified Directory Section arranged alphabetically.

—A—

Abrams Aerial Survey Corp., 606 Shirwasse St., Lansing, Mich.
Pres. & Sales Mgr.—Talbert Abrams
V. Pres.—G. E. McArthur
Gen. Mgr.—W. S. Karr
Ch. Engr.—Bruce Buchanan
Prod. Mgr.—Alva Warren

Abrams Inst. Co., 606 Shirwasse St., Lansing, Mich.
Pres.—Talbert Abrams
Gen. Mgr.—B. Van Kirk
Ch. Engr.—Milford B. Moore
Prod. Mgr.—Rudolph Royce

AC Spark Plug Co., General Motors Corp., 930 Harriet St., Flint, Mich.
Pres.—L. C. Goad
Ch. Engr.—C. W. McKinley
Sales Mgr.—W. S. Isherwood

Adams & Westlake, Elkhart, Ind.

Aerial Machine & Tool Corp., 260 West St., New York, N. Y.

Aero Instrument Co., 1003 Lorain Ave., Cleveland, Ohio

Aeromarine Instrument Co., 420 Austin Pl., New York, N. Y.

Aeronautical Radio Co., Roosevelt Field, Mineola, N. Y.
Pres.—George W. McCauley
Ch. Engr.—Bernard Knapp
Sales Mgr.—Chas. Fast

Aero Service Corp., 1612 Chancellor St., Philadelphia, Pa.

Aero Spark Plug Co., 635 Greenwich St., New York, N. Y.
Pres. & Sales Mgr.—William E. Blood
V. Pres. & Ch. Engr.—A. A. Kasarjian

Aero Supply Mfg. Co., 61 W. Main St., Corry, Pa.

Aerovoice, Inc., Islip, N. Y.
Pres. & Sales Mgr.—A. E. Theis
V. Pres. & Ch. Engr.—Warren Wiener
Prod. Engr.—Henry Janes

Air Associates, Inc., Roosevelt Field, Garden City, N. Y.

Aircraft Accessories Corp., 5210 San Fernando Rd., Glendale, Cal.
Pres.—Ted Lynn
V. Pres.—Edward Burke
Ch. Engr.—Rodney Campbell
Sales Mgr.—Edward Burke

Aircraft Development Co., 1530 Olive St., N. E., Washington, D. C.
Pres. & Ch. Engr.—Willard A. Driggers
V. Pres.—Norman R. Cissell

Aircraft Hardware Mfg. Co., 1391 Lafayette Ave., New York, N. Y.
Pres.—O. Mazzei
V. Pres.—M. Bresciani
Ch. Engr.—A. Babboni

Aircraft Radio Corp., Boonton, N. J.
Pres.—Lewis M. Hull
V. Pres.—Frederick H. Drake, Paul O. Farnham

Aircraft Steel & Supply Co., 419 N. Water St., Wichita, Kan.
Pres.—O. W. Wortman
V. Pres.—K. W. Pringle
Sales Mgr.—F. H. McMichael
Sales—J. Tschoep
Sales—C. J. Lucas

Air-Maze Corp., 5200 Harvard Ave., Cleveland, Ohio
Pres.—A. E. Schaaf
V. Pres.—G. M. Walton
Ch. Engr.—P. C. Hungerford
Sales Mgr.—H. H. Schaaf

Airplane & Marine Direction Finder Corp., Clearfield, Pa.
Chairman Board—Theodore W. Stemmler
V. Pres.—Edward S. Little
Ch. Engr.—Wm. F. Diehl
Gen. Mgr.—McMurdo Silver

Air Radio, 5214 W. 63d St., Chicago, Ill.

Air Reduction Sales Co., 60 East 42nd St., New York, N. Y.

Airtherm Mfg. Co., 1474 S. Vandeventer Ave., St. Louis, Mo.

Air-Track Mfg. Corp., McLachlen Bldg., Washington, D. C.
Pres.—Rex C. Jacobs
V. Pres.—Clare S. Jacobs
V. Pres.—Sidney F. Mashbir

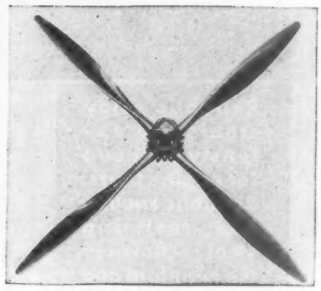
Air Transport Equipment, Roosevelt Field, Garden City, N. Y.

Air-Ways Equipment Corp., Milwaukee, Wis.

Aladdin Radio Industries, Inc., 466 W. Superior St., Chicago, Ill.

Albertson & Co., Sioux City, Ia.

Algoma Plywood & Veneer Co., Algoma, Wis.



4-blade Hydromatic Full Feathering Propeller—Hamilton-Standard Propellers, Div. of United Aircraft Corp.

Allegheny Ludlum Steel Corp., Brackenridge, Pa.
Pres.—H. G. Batcheller
V. Pres.—F. H. Stephens
V. Pres.—J. O. Carr
Ch. Engr.—Jack Taylor
Asst. to Pres.—R. M. Allen

Allison Engineering Co., Div. General Motors Corp., Speedway, Indianapolis, Ind.

Allith-Prouty, Inc., 819 N. Bowman Ave., Danville, Ill.
Pres.—D. E. Willard
Sec. & Treas.—A. MacDonald
Ch. Engr.—R. B. Older
Sales Mgr.—N. B. Hart

Aluminum Co. of America, Gulf Bldg., Pittsburgh, Pa.
Pres.—Roy A. Hunt
V. Pres. Chg. Sales—George R. Gibbons
V. Pres. & Gen. Sales Mgr.—Geo J. Stanley
Ch. Engr.—T. D. Jolly

Aluminum Industries, Inc., 2416 Beekman St., Cincinnati, Ohio
Pres.—John Eckerle
V. Pres.—M. A. Beckmann
Ch. Engr.—C. C. Rensing
Gen. Mgr.—H. J. Hater

American Airport Equipment Co., 5958 Washington Blvd., Chicago, Ill.

American Armament Corp., 6 East 45th St., New York, N. Y.
Pres.—A. J. Miranda, Jr.
V. Pres.—I. J. Miranda
Ch. Engr.—B. P. Joyce (Armament)
D. deLackner (Aircraft)

American Blower Corp., 6000 Russell St., Detroit, Mich.

American Bosch Corp., 3664 Main St., Springfield, Mass.
Pres.—Donald P. Hess
V. Pres.—Julius E. Wild
Ch. Engr.—W. E. Schwarzman
Sales Mgr.—Edward C. Peck

American Brass Co., Waterbury, Conn.
Pres.—John A. Coe
V. Pres.—C. F. Hollister
V. Pres.—C. S. Judd
V. Pres.—F. E. Weaver
V. Pres.—E. S. Wayland
Ch. Engr.—J. R. Coe
Sales Mgr.—John A. Coe, Jr.
Met. Mgr.—John Freeman

American Cable Div., American Chain & Cable Co., 230 Park Ave., New York, N. Y.
Mgr. Aircraft Dept.—H. Macmillan

American Chain & Cable Co., Inc., 230 Park Ave., New York, N. Y., and 929 Connecticut Ave., Bridgeport, Conn.
Pres.—W. T. Morris
V. Pres.—W. F. Wheeler
Ch. Engr.—E. S. Wellhofer
Sales Mgr.—G. C. Moon

American Chemical Paint Co., Ambler, Pa.
Pres.—Leon Cherksey
V. Pres. & Sales Mgr.—F. P. Spruance
Ch. Chemist—Alfred Douty

American Engineering Co., Aramingo Ave. & Cumberland St., Philadelphia, Pa.

American Felt Co., 315 Fourth Ave., New York, N. Y.
Pres.—John T. Lawless
V. Pres.—Jule F. Marshall
Ch. Engr.—H. A. Boeddinghaus

American Gas Accumulator Co., Electrical Div., 1029 Newark Ave., Elizabeth, N. J.
Pres.—L. M. Merrill
V. Pres.—John R. Munn
Chf. Engr.—V. L. Oestnaes

American Hair & Felt Co., 1844 Merchandise Mart, Chicago, Ill.

American Hard Rubber Co., 11 Mercer St., New York, N. Y., and Akron, O.
Sales Mgr.—G. B. Glaenzer

American Heating & Ventilating Co., 1505 Race St., Philadelphia, Pa.

American-LaFrance-Foamite Corp., 12 LaFrance St., Elmira, N. Y.
Pres.—E. E. O'Neill
V. Pres.—W. M. Cooper
V. Pres. Chg. Mfg.—C. F. Smith
Sales Mgr.—F. H. Steinicke
Gen. Sales Mgr.—J. O. Binford
Ch. Engr.—C. H. Lindsay

American Magnesium Corp., 2210 Harvard Ave., Cleveland, Ohio

American Metal Hose Div., American Brass Co., Waterbury, Conn.
V. Pres.—C. S. Hungerford
Ch. Engr.—J. C. G. Maxwell
Mgr.—W. B. Pickard

American Non Gran Bronze Corp., Berwyn, Pa.
Pres.—P. Exton Guckes

Tire—B. F. Goodrich Company

V. Pres. & Sales Mgr.—Reeves K. Johnson
Ch. Engr.—John McMahon

American Optical Co., Southbridge, Mass.
Pres.—George B. Wells
V. Pres.—Ira Mosher
V. Pres. & Sales Mgr.—C. O. Cozzens
Treas.—E. E. Williams
Plant Mgr.—G. R. Wescott

American Paulin System, 1845 S. Flower St., Los Angeles, Cal.

American Radiator Co., 40 W. 40th St., New York, N. Y.

American Screw Co., 21 Stevens St., Providence, R. I.

American Steel & Wire Co., Rockefeller Bldg., Cleveland, Ohio

American Tube Bending Co., 5 S. Lawrence St., New Haven, Conn.
Pres.—Henry W. Jones, Jr.
Factory Mgr.—Bulkeley Smith

American Window Glass Co., Farmers Bank Bldg., Pittsburgh, Pa.
Pres.—W. L. Monro, Sr.
V. Pres.—W. L. Monro, Jr.
Ch. Engr.—L. J. Pierce
Sales Mgr.—Chas. H. Pascoe
Asst. Sales Mgr.—H. H. Parker

Ampco Metal, Inc., 3830 W. Burnham St., Milwaukee, Wis.
Pres. & Gen. Mgr.—C. J. Zaiser
Sec. & Treas.—R. W. Uecker
Engr.—Oscar Frohman
Sales Engr.—J. Arter

Anaconda Wire & Cable Co., 25 Broadway, New York, N. Y.
Pres.—H. Donn Keresey
V. Pres.—W. E. Sprackling
Ch. Engr.—L. F. Hickernell
Sales Mgr.—L. R. Love

Anchor Post Fence Co., Eastern Ave. & Kane St., Baltimore, Md.
Pres.—Wm. F. Brannan
V. Pres.—L. H. Johnson
V. Pres. & Sales Mgr.—R. D. Logee

Aqua Systems, Inc., 2443 Third Ave., New York, N. Y.

Arens Controls, Inc., 2253 S. Halsted St., Chicago, Ill.
Pres. & Ch. Engr.—Charles A. Arens
V. Pres. & Sales Mgr.—Calhoun Norton
Supt.—George H. Kuhl

Atlantic Refining Co., 260 S. Broad St., Philadelphia, Pa.

Atlas Drop Forge Co., 421 Mt. Hope Ave., W., Lansing, Mich.

Atlas Press Co., 1816 N. Pitcher St., Kalamazoo, Mich.
Pres.—J. H. Penniman
Ch. Engr.—H. E. Musselman
Sales Mgr.—G. C. Nancarrow

Atlas Steel Casting Co., 1963 Elmwood Ave., Buffalo, N. Y.

Auld Co., D. L., Fifth Ave. & Fifth St., Columbus, Ohio

Austin Co., 16112 Euclid Ave., Cleveland, Ohio

—B—

Bache Semon & Co., 636 Greenwich St., New York, N. Y.

Bakelite Corp., 247 Park Ave., New York, N. Y.
Pres.—J. A. Rafferty
V. Pres.—J. Baekeland
V. Pres.—Candford Brown
V. Pres.—J. Davidson
Sales Mgr.—Gordon Brown

Baker Industrial Truck Co., 2168 W. 25th St., Cleveland, Ohio
Pres.—E. J. Bartlett
V. Pres.—E. J. Stahl
Ch. Engr.—E. H. Remde
Sales Mgr.—D. L. Darnell

Baker-Raulang Co., 2168 W. 25th St., Cleveland, Ohio

Balsa Wood Co., 158 Pioneer St., Brooklyn, N. Y.

Bantam Bearings Corp., 3702 W. Sample St., South Bend, Ind.

Barbour Stockwell Co., 205 Broadway, Cambridge, Mass.
Pres.—Ernest F. Stockwell
Sales Engr.—Edward T. Blanchard

Barkley-Grow Aircraft Corp., 13210 French Rd., Detroit, Mich.
Pres.—George C. Moseley
Asst. to Pres.—John D. Michel
Ch. Engr.—W. F. Degroat

Barnes Div., Wallace, Associated Spring Corp., Bristol, Conn.
Pres.—Fuller F. Barnes
Sales Mgr.—Harold B. Reid

Bartow Beacons, Inc., 1424 Walnut St., Philadelphia, Pa.

Bauer & Black, 2500 S. Dearborn St., Chicago, Ill.

YOU HEAR IT EVERYWHERE!

"The STAND-OUT VALUE IN THE LOW-PRICE FIELD"

"That sleek new streamlined enclosed cowling is a honey for beauty."

"No more putt-putt. Listen to the smooth rhythmic purr from that new undercabin exhaust."

"Boy! What a plane for performance. It's got everything."

"Those new adjustable ventilators really air-condition the cabin without draft."

"What a luxurious cabin with scientific soundproofing."

"Plenty of cabin room and really comfortable chair-height adjustable seating."

"Wheel or modernized stick control — interchangeable as you prefer."

"Looks and flys like twice the money."

"— and don't forget — Taylorcraft's safety record is first in its class."

IT'S Taylorcraft FOR 1940

AMERICA'S MOST MODERN LOW-PRICED AIRPLANE

Take A Look! Take A Flight! Compare Taylorcraft and see the difference. Write, today, for descriptive brochure and the name of a nearby dealer. Let us arrange an early demonstration for you.

65-60-55 and 50 H.P. Deluxe Models

NEW TRAINER Modern Side-by-Side Seating and interchangeable wheel or stick control.

$1495 F.A.F. Alliance

TAYLORCRAFT AVIATION CORPORATION

Dept. 25 Alliance, Ohio

Bausch & Lomb Optical Co., 635 St. Paul St., Rochester, N. Y.

Baush Machine & Tool Co., Springfield, Mass.

B-B-T Corp. of America, 1029 Newark Ave., Newark, N. J.

Bearium Metals Corp., 258 State St., Rochester, N. Y.

Belden Mfg. Co., 4673 W. Van Buren St., Chicago, Ill.

Bendix Products Div., Bendix Aviation Corp., 401 Bendix Drive, South Bend, Ind.
Gen. Mgr.—M. P. Ferguson
Dir. Eng.—K. M. Wise
Dir. Eng. & Sales—F. B. Mock
Dir. Sales—F. B. Willis
Mgr.—J. R. Cautley
Ch. Engr.—J. M. Miller

Bendix Radio Corp., Subsidiary of Bendix Aviaiton Corp., 920 East Fort Ave., Baltimore, Md.
Pres.—Vincent Bendix
V. Pres.—Lawrence A. Hyland
V. Pres. Sales & Eng.—W. P. Hilliard
Mgr. Commercial Sales—Reed R. Brunner
Sales Eng.—John W. Hammond

Bendix Radio Corp., 60 E. 25th St., Chicago, Ill.

Quadruple Indicator, Remote—Kollsman Instrument Div., Square D Co.

Berling Magneto Co., 40 Laird Ave., Buffalo, N. Y.

Berry Bros., Inc., 211 Leib St., Detroit, Mich.
Pres.—Arthur Kiernan
V. Pres.—T. B. Colby
Chemist—H. C. Reed
Sales Mgr.—C. E. Spooner

Bethlehem Steel Co., Bethlehem, Pa.

B G Corp., The, 136 W. 52d St., New York, N. Y.
Pres.—Richard Goldsmith
V. Pres.—Lawrence L. Goldsmith
Ch. Engr.—George M. Paulson
Sales Mgr.—Raymond W. Leedom
Export Sales Mgr.—K. S. Lindsay

Billings & Spencer Co., Laurel & Park Sts., Hartford, Conn.

Binks Mfg. Co., 3114 Carroll Ave., Chicago, Ill.
Pres.—J. F. Roche
V. Pres & Sales Mgr.—J. F. Roche, Jr.
V. Pres. & Ch. Engr.—S. Bramsen

Black & Decker Mfg. Co., Towson, Md.
Pres.—S. Duncan Black
V. Pres.—Alonzo G. Decker
Ch. Engr.—Glen Wilhide
Sales Mgr.—Robert D. Black

Blackhawk Mfg. Co., 5325 W. Rogers St., Milwaukee, Wis.
Pres.—H. P. Brumder
V. Pres.—J. C. Merker
Ch. Engr.—E. M. Pfauser
Sales Mgr.—G. H. Goehrig
Mgr. Ind. Supply Div.—B. E. Hotvedt

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

Bloxham Aero Mfg. Co., Chicago, Ill.

Bohn Aluminum & Brass Corp., Lafayette Bldg., Detroit, Mich.

Booth Felt Co., 463 19th St., Brooklyn, N. Y.

Boston Auto Gage Co., 70 West St., Pittsfield, Mass.
Pres. & Sales Mgr.—Thos. C. Nelson
V. Pres. & Ch. Engr.—H. MacKelvie

Boston Gear Works, Inc., North Quincy, Mass.
Pres.—H. H. Kerr
V. Pres. Chg. Sales & Sales Mgr.—Walter J. Henry
V. Pres. Chg. Engrg.—Martin Schumb

Boston Insulated Wire & Cable Co., Boston, 25, Mass.
Pres.—H. B. Burley
V. Pres & Ch. Engr.—J. C. Burley

Bound Brook Oil-less Bearing Co., Lincoln Blvd., Bound Brook, N. J.
Pres.—W. F. Jennings
V. Pres. & Sales Mgr.—H. O. Johnson
Research Engr.—Dr. Carl Claus

Bowlus Sailplanes Inc., San Fernando, Cal.
Pres.—Donald S. Mitchell
V. Pres. & Gen. Mgr.—Ray Cooper
Ch. Engr.—Wm. Hawley Bowlus

Bowser & Co., S. F., 1302 E. Creighton Ave., Fort Wayne, Ind.
Pres.—R. Hosken Damon
Executive V. Pres. & Treas.—E. D. Eggimann
V. Pres. & Gen. Sales Mgr.—E. C. Marsh
Ch. Engr.—C. P. Griffith
Export Mgr.—R. D. Courtright

Bravo Products Co., Ann Arbor, Mich.

Bredouw Aeromotive Corp., 334 Richards Rd., Municipal Airport, Kansas City, Mo.
Pres.—Homer L. Bredouw
V. Pres.—W. J. Hermann
Sales Mgr. & Sec.—W. E. Briece

Breeze Corporations, Inc., 41 S. Sixth St., Newark, N. J.
Pres. & Treas.—H. L. Bolton
V. Pres. & Sec.—J. T. Mascuch
V. Pres.—J. F. Lucas, M. M. Eells

Brewster Aeronautical Corp., Northern Blvd. at 35th St., Long Island City, N. Y.
Pres.—James Work
V. Pres. & Ch. Engr.—Dayton T. Brown
V. Pres. & Sales Mgr.—P. M. Stephenson

Brunner Mfg. Co., 1821 Broad St., Utica, N. Y.

Brush Development Co., 3311 Perkins Ave., Cleveland, Ohio

Budd Mfg. Co., Edward G., 25th & Hunting Park Ave., Philadelphia, Pa.

Buffalo Forge Co., 490 Broadway, Buffalo, N. Y.
Pres.—E. F. Wendt
V. Pres.—H. W. Wendt
Ch. Engr.—A. A. Criqui
Sales Mgr.—C. A. Booth

Buhl Stamping Co., 2730 Scotten Ave., Detroit, Mich.

Bullard Co., E. D., 275 Eighth St., San Francisco, Cal.

Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit, Mich.

Bunting Brass & Bronze Co., 715 Spencer St., Toledo, Ohio
Pres.—C. E. Bunting
V. Pres.—D. McKercher
Sales Mgr.—Geo. H. Adams

Burgess Battery Co., Freeport, Ill.
Pres.—D. W. Hirtle
Ch. Engr.—H. W. Porth
Ind. Mgr.—E. C. Nickerson
Sales Engr.—V. G. Reel

Burroughs Wellcome & Co., 9 E. 41st St., New York City
Dir. of Sales—C. R. Brown

Burton-Rogers Co., 857 Boylston St., Boston, Mass. (Sole Distributors for Hoyt Electrical Instrument Works, Boston, Mass.)
Pres. & Sales Mgr.—C. W. Burton
Ch. Engr.—V. S. Church

—C—

California Propeller Co., 5075 W. Imperial Highway, Inglewood, Cal.

Cambridge Instrument Co., Grand Central Terminal, New York, N. Y.

Campbell, Andrew C., Div. of American Chain & Cable Co., Inc., Bridgeport, Conn.
Pres.—William T. Morris
Ch. Eng.—Harry Robinson
Sales Mgr.—R. J. Southwell

Cannon Electric Development Co., 420 West Ave. 33, Los Angeles, Cal.

Canton Drop Forging & Mfg. Co., Canton, Ohio

Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh, Pa.

Carpenter Steel Co., Reading, Pa.
Pres. & Sales Mgr.—F. A. Bigelow
V. Pres.—J. H. Parker
Ch. Engr.—J. M. Rothermel

Carron Co., The, Ludington, Mich.

Caterpillar Tractor Co., Peoria, Ill.
Pres.—B. C. Heacock
Executive V. Pres.—A. T. Brown
Ch. Engr.—H. S. Eberhard
Sales Mgr.—D. A. Robison

Chambersburg Engineering Co., Chambersburg, Pa.
Pres.—Eugene C. Clarke
V. Pres.—R. E. W. Harrison
Ch. Engr.—M. H. Ivins

Champion Spark Plug Co., Upton Ave., Toledo, Ohio
Pres.—R. A. Stranahan
V. Pres.—M. C. Dewitt
V. Pres. & Sales Mgr. Duane Stranahan
Ch. Engr.—Earl S. Twining

Chandler-Evans Corp., South Meriden, Conn.
Pres.—C. W. Deeds
Executive V. Pres.—B. H. Gilpin
V. Pres. Chg. Engrg.—M. E. Chandler

Chandler Groves Co., Detroit, Mich.

Chase Brass & Copper Co., Waterbury, Conn.

Chase & Co., L. C., 295 Fifth Ave., New York, N. Y.

Chelsea Clock Co., 284 Everett Ave., Chelsea, Mass.

Chicago Metal Hose Corp., 1315 S. Third Ave., Maywood, Ill.

Chicago Rawhide Mfg. Co., 1296 Elston Ave., Chicago, Ill

Chicago Pneumatic Tool Co., 6 E. 44th St., New York, N. Y.
Pres.—H. A. Jackson
Executive V. Pres.—W. L. Lewis

Chrysler Corp., Amplex Div., 6501 Harper Ave., Detroit, Mich.
Pres.—A. J. Langhammer
Ch. Engr.—Geo. E. Platzer
Sales Mgr.—A. H. Merschel

Cities Service Oil Co., 70 Pine St., New York, N. Y.

Clarage Fan Co., North & Porter Sts., Kalamazoo, Mich.

Clark Tructractor Div., Clark Equipment Co., Battle Creek, Mich.

Claude Neon Lights, Inc., 41 E. 42d St., New York, N. Y.

Cleveland Pneumatic Tool Co., 3734 E. 78th St., Cleveland, Ohio

Cleveland Tractor Co., 19300 Euclid Ave., Cleveland, Ohio
Pres.—W. King White
V. Pres.—H. P. Mee
Ch. Engr.—J. G. Heaslet
Sales Mgr.—W. Ellzey Brown
Ag. Sales—Chas. Karr
Ind. Sales—W. E. Miles

Cleveland Tungsten Mfg. Co., 10200 Meech Ave., Cleveland, Ohio

Climax Molybdenum Co., 500 Fifth Ave., New York, N. Y.

Collins & Aikman Corp., 200 Madison Ave., New York, N. Y.

Collins Radio Co., Cedar Rapids, Iowa
Pres.—A. A. Collins
V. Pres.—M. H. Collins
Ch. Engr.—L. M. Craft
Sales Mgr.—Clair Miller

Colonial Beacon Oil Co.—see Esso Marketers

Columbian Steel Tank Co., 1509 W. 12th St., Kansas City, Mo.

Colvinex Corp., 250 E. 43d St., New York, N. Y.

Communication Development Corp., 156 Liberty St., New York, N. Y.

Continental-Diamond Fibre Co., Newark, Del.

Continental Machines, Inc., 1301 Washington Ave., S., Minneapolis, Minn.
Pres.—Leighton A. Wilkie
V. Pres.—R. J. Wilkie
V. Pres. & Ch. Engr.—J. W. Wilkie

Seat Cushioning Material—Firestone Tire & Rubber Co.

Continental Rubber Works, 19th & Liberty St., Erie, Pa.
Pres.—Theron R. Palmer
V. Pres.—Alexander Jarecki
Ch. Engr. Mr. Lansberry
Sales Mgr.—Henry T. Fowler

Continental Steel Corp., 1150 S. Main St., Kokomo, Ind.

Cook Paint & Varnish Co., Kansas City Mo.

Corcoran-Brown Lamp Div., Electric Auto-Lite Co., 4900 Spring Grove Ave., Cincinnati, Ohio

Cornell Iron Works, Inc., 36th Ave. & 13th St., Long Island City, N. Y.
Pres.—M. L. Cornell
V. Pres.—J. B. Cornell
Ch. Engr.—R. K. Bennett
Sales Mgr.—M. J. Graff

C-O-Two Fire Equipment Co., 10 Empire St., Newark, N. J.
Pres.—S. E. Allen
V. Pres. & Sales Mgr. M. A. Laswell
Ch. Engr.—F. B. Allen

Cramer Co., R. W., Centerbrook, Conn.

Crouse-Hinds Co., Wolf & Seventh North Sts., Syracuse, N. Y.
Pres.—H. B. Crouse
V. Pres.—W. L. Hinds
Ch. Engr.—C. H. Bissell
Sales Mgr.—A. F. Hills

Crucible Steel Co. of America, 405 Lexington Ave., New York, N. Y.
Pres.—Raoul E. Desvernine
Gen. Sales Mgr.—A. T. Galbraith

Crusader Oil Co., Elizabeth, N. J.

Cunningham-Hall Aircraft Corp., 13 Canal St., Rochester, N. Y.
Pres. & Sales Mgr.—Francis E. Cunningham
V. Pres.—Augustine J. Cunningham
Ch. Engr.—Randolph F. Hall

Cuno Engineering Corp., Meriden, Conn.
Pres.—C. H. Cuno
V. Pres. & Ch. Engr.—S. L. Wolfson
Sales Mgr.—C. A. Lind
Sales Engr.—D. H. Van Vleck

Curran Corp., 6 Pleasant St., Malden, Mass.

Curtis Pneumatic Machinery Co., St. Louis, Mo.

Curtiss-Wright Corp., Curtiss Propeller Div., Clifton, N. J.
Pres.—G. W. Vaughan
V. Pres.—J. A. B. Smith
V. Pres. & Gen. Mgr.—R. L. Earle
Sec. & Treas.—E. S. Cramer

Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee, Wis.
Pres.—F. R. Bacon
V. Pres. Chg. Sales & Engrg. G. S. Crane
Ch. Engr.—P. B. Harwood
Sales Mgr.—B. M. Horter
Mgr. Appliance Sales—H. B. Phillips
Mgr. Foreign Sales—T. D. Montgomery

Cyclone Fence Co., Waukegan, Ill.

—D—

Dahlstrom Metallic Door Co., Buffalo & E. Second Sts., Jamestown, N. Y.
Pres.—Paul N. Anderson
V. Pres.—Clay Emerson
Ch. Engr.—Carl Thierfeldt
Sales Mgr.—Maurice W. Wiesner

Dalco, Heartwell Bldg., Long Beach, Cal.

Dardelet Threadlock Corp., 55 Liberty St., New York, N. Y.

Davis Aircraft Co., Los Angeles, Calif.
Pres.—Curt L. Davis
Ch. Engr.—Curt L. Davis

Davis Emergency Equipment Co., 55 Van Dam St., New York, N. Y.

Dayton Mfg. Co., 2240 E. Third St., Dayton, Ohio

Dayton Wheel Co., Dayton, Ohio

Detroit Gasket & Mfg. Co., 12640 Burt Rd., Detroit, Mich.

DeVilbiss Co., 300 Phillips Ave., Toledo, Ohio
Pres.—A. D. Gutchess
V. Pres.—F. A. Bailey
Ch. Eng. H. C. Lambert
Sales Mgr. Ind. Div.—R. A. Guyer

Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.
Chairman Board—H. H. Doehler
Pres.—C. Pack
Sales Mgr.—L. H. Pillion

Dow Chemical Co., Midland, Mich.

Dry-Zero Corp., 222 N. Bank Drive, Chicago, Ill.
Pres.—Harvey B. Lindsay
V. Pres.—L. M. Cunningham
Ch. Engr.—C. Hunter Lindsay
Sales Mgr. Transport Div.—C. Duff Stevens

"American" Adds Still More Goodrich-Equipped Flagships

to Meet New Expanding Service and Schedules

Goodrich Tires and DE-ICERS on New Units of American Airlines' Enlarged Fleet

FIFTY per cent more passengers! Sixty-six million more passenger miles! A "Flagship" fleet grown one-third bigger! These are some of the impressive strides made by American Airlines during the past year—and passenger mileage is still climbing fast!

Naturally, this fast-growing service constantly imposes a bigger responsibility on planes, motors, tires. And it is significant that after an exacting analysis of its new requirements, American Airlines again chose Goodrich Airplane Silvertowns for safer, smoother landings—Goodrich DE-ICERS for protection against ice during winter and high altitude flying.

Remember, Goodrich experience covers the entire range of aviation's needs—not alone in tires and DE-ICERS but in the new, smoother-acting Goodrich E.T.* Brakes and over 40 other products. Get the benefits of this many-sided experience by specifying *Goodrich*. Write The B. F. Goodrich Co., Aeronautical Division, Akron, Ohio, for complete information.

*Goodrich Expander Tube Brakes are manufactured under license and sold by Hayes Industries, Inc., Jackson, Mich., and Bendix Aviation Corp., South Bend, Ind.

● ON THE "GO" DAY AND NIGHT. American Airlines' big fleet of "Flagships" now covers 6,775 miles of route, lacing together 57 major cities of the nation. Small wonder then that "American" twice last year reordered planes, with still more to come. Like their predecessors, these new units, too, have Goodrich equipment on the job with them 24 hours a day.

Goodrich *Airplane* Silvertowns

THE SAFEST AIRPLANE TIRE EVER BUILT

Over 40 Rubber Products for Airplanes — including Tires — Tail Wheels — Abrasion Shoes — DE-ICERS — Matting — Rubber Hose — Grommets — Shock Absorber Cord — A Complete Line of Rubber Aeronautical Accessories.

Ducommun Metals & Supply Co., 219 S. Central Ave., Los Angeles, Cal.
Pres.—E. C. Ducommun
V. Pres.—E. F. Ducommun
Sales Mgr.—E. H. Vockrodt

du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.

du Pont de Nemours & Co., E. I., Plastics Dept., 626 Schuyler Ave., Arlington, N. J.
Sales Mgr.—W. A. Joslyn
Asst. Adv. Mgr.—Edward J. Pechin

Duro Co., 537 E. Monument Ave., Dayton, Ohio

Dycer Aviation Supplies, 11156 S. Main St., Los Angeles, Cal.
Owner & Sales Mgr.—Edward A. Dycer

Dzus Fastener Co., Babylon, N. Y.

—E—

Eagle Ottawa Leather Co., Grand Haven, Mich.
V. Pres.—Samuel Smickler
Sales Mgr.—E. K. Ellis

Eastman Kodak Co., Rochester, N. Y.

Eclipse Aviation Div., Bendix Aviation Corp., Bendix, N. J.
Gen. Mgr.—R. P. Lansing
Sales Mgr.—A. E. Raabe
Executive Engr.—C. C. Shangraw

Edo Aircraft Corp., College Point, N. Y.
Pres.—Earl D. Osborn
V. Pres. & Sales Mgr.—George B. Post
Ch. Engr.—B. V. Korvin-Kroukovsky
Factory Mgr.—K. D. Vosler

Elastic Stop Nut Corp., 1001 Newark Ave., Elizabeth, N. J.
Pres.—C. A. Swanstrom
V. Pres. & Sales Mgr.—H. B. Thomas
V. Pres.—K. A. Swanstrom
Ch. Engr.—D. C. Hungerford

Electric Specialty Co., 211 South St., Stamford, Conn.

Electric Storage Battery Co., Allegheny Ave. & 19th St., Philadelphia, Pa.
Pres.—R. C. Norberg
V. Pres. & Sales Mgr.—Frank T. Kalas
Ch. Engr.—Dr. J. Lester Woodbridge
Mgr. Mfg. Sales—Wm. C. Leingang
Mgr. Replacement Sales—R. L. Sommerville

Electrical Development Co., 2217 S. Grand Ave., Los Angeles, Cal.

Electro-Metallurgical Co., 30 E. 42nd St., New York, N. Y.

Elgin National Watch Co., Elgin, Ill.

Endicott Forging & Mfg. Co., 1941 North St., Endicott, N. Y.
Pres.—Thos. B. Kelday
Sales Mgr.—A. W. Schaefer

Engel Aircraft Specialties, Escondido, Cal.
Mgr.—John H. Engel

Engineering & Research Corp., Riverdale, Md.
Pres.—Henry A. Berliner
V. Pres.—L. A. Wells
Ch. Engr.—F. E. Weick
Sales Mgr. Machy.—E. E. Wagner
Sales Mgr. Aircraft—R. Sanders

Esso Marketers, 26 Broadway, New York, N. Y.
Sales Mgr.—R. C. Oertel
Asst. Sales Mgr.—H. W. Howze

Ethyl Gasoline Corp., 405 Lexington Ave., New York, N. Y.

Evans Appliance Co., Fullerton Ave. at Greenfield Rd., Detroit, Mich.

Everel Propeller Corp., Baltimore Trust Bldg., Baltimore, Md.
Pres.—Frank Ellington
Executive V. Pres.—Walter W. Everts
V. Pres. Sales—Sidney H. Fedan
Ch. Engr.—Paul F. Hackethal

Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
Pres.—Phil Huber
V. Pres. & Sales Mgr.—Thor Olson
Ch. Engr.—Ira Snader
Aircraft Sales—D. N. McIver

—F—

Fafnir Bearing Co., 37 Booth St., New Britain, Conn.

Fahlin Aircraft Co., Marshall, Mo.
Pres.—Ole Fahlin
Sales Mgr.—Don Holt

Fairchild Aviation Corp., 88-06 Van Wyck Blvd., Jamaica, N. Y.
Pres.—J. S. Ogsbury
Executive V. Pres.—Ernest Robinson
V. Pres.—C. A. Harrison
Ch. Engr.—George Rattray
Sales Mgr.—International Sales—Burnham Litchfield

Farrel-Birmingham Co., Ansonia, Conn.
Pres.—N. W. Pickering
V. Pres. & Sales Mgr.—Carl Hitchcock
V. Pres.—A. S. Redway
Ch. Engr.—R. A. North

Fay & Egan Co., J. A., Colerain Ave. & Alfred St., Cincinnati, Ohio
Pres.—Harry C. Burns
Sec. & Treas.—Earl H. Coplan
Ch. Engr.—Wm. S. Williams
Sales Mgr.—C. G. Engbersen

Federal Aircraft Works, 3456 Mississippi Drive, Minneapolis, Minn.
V. Pres. & Gen. Mgr.—Franis J. Ditter
Ch. Engr.—E. J. Boucher
Sales Mgr.—A. A. Bursch

Federal Laboratories, Inc., 185 41st St., Pittsburgh, Pa.

Federal-Mogul Corp., 11031 Shoemaker St., Detroit, Mich.

Felters Co., 210 South St., Boston, Mass.
Pres.—W. C. King, Sr.
V. Pres.—L. H. Hansel
Sales Mgr.—W. C. King, Jr.

Fink-Dumont-White, Inc., 270 Lafayette St., New York, N. Y.
Pres. & Sales Mgr.—R. Duval Dumont
V. Pres. & Ch. Engr.—George W. Sawyer

Firestone Tire & Rubber Co., S. Main St., Akron, Ohio
Pres.—J. W. Thomas
V. Pres.—H. S. Firestone, Jr.
V. Pres.—L. R. Jackson

Fischer's Surfa-Saver, Inc., Paddock Rd. & B. & O. R.R., Cincinnati, Ohio
Pres. & Sales Mgr.—Heinrich Fischer
V. Pres. & Ch. Engr.—Wilbur Culp

Fisher Research Laboratories Sales Co., 45 Rockefeller Plaza, New York, N. Y.

Fiske Brothers Refining Co., 129 Lockwood St., Newark, N. J.
Pres.—F. J. Snyder
V. Pres.—F. W. Edwards
Ch. Engr.—G. E. Merkle
Mgr. Lubriplate Div.—R. L. Watts

4-blade Propeller — Curtiss Propeller Division, Curtiss-Wright Corporation

Fitzgerald Mfg. Co., Torrington, Conn.

Flash Fire Extinguisher Co., Dayton, Ohio

Fleetwings, Inc., Bristol, Pa.
Pres.—Frank de Ganahl
V. Pres. & Ch. Engr.—W. L. Sutton
V. Pres.—Carl de Ganahl

Flottorp Propeller Co., Grand Rapids Airport, Grand Rapids, Mich.

Fog Nozzle Co., 1520 E. Slauson Ave., Los Angeles, Cal.

Follmer Clogg & Co., Lancaster, Pa.

Folmer Graflex Corp., 154 Clarissa St., Rochester, N. Y.

Ford Sales Co., J. B., Wyandotte, Mich.
Pres.—C. B. Robinson
Sales Mgr.—W. M. Cole

Formica Insulation Co., 4614 Spring Grove Ave., Cincinnati, Ohio
Pres.—D. J. O'Conor
Ch. Engr.—R. W. Lytle
Sales Mgr.—W. G. Steiner

Four Wheel Drive Auto Co., Clintonville, Wis.

Foxboro Co., Neponset Ave., Foxboro, Mass.

Friez & Sons, Julien P., Div. Bendix Aviation Corp., 4 Central Ave., Baltimore, Md.
Pres.—Vincent Bendix
V. Pres.—Charles Marcus
Gen. Mgr.—Lucien L. Friez

Fuel Development Corp., 62 William St., New York, N. Y.
Pres.—Robert B. Meyer
V. Pres. & Chf. Eng.—Leo B. Kimball

—G—

Gardner Propeller Co., 1215 Circle Ave., Forest Park, Ill.
Pres.—G. A. Gardner
Ch. Engr.—Wm. H. Gardner

Garlock Packing Co., Palmyra, N. Y.
Pres.—Geo. L. Abbott
V. Pres Prod.—C. R. Hubbard
V. Pres. Sales—Phil Arnold

Garrison Engineering Co., Great Barrington, Mass.

Gem Shine Products Co., 7945 S. Elizabeth St., Chicago, Ill.

General Cable Corp., 420 Lexington Ave., New York, N. Y.

Helmet—Jacket—Willis & Geiger, Inc.

General Electric Co., Incandescent Lamp Dept., Nela Park, Cleveland, Ohio

General Electric Co., Schenectady, N. Y.

General Radio Co., 30 State St., Cambridge, Mass.
Pres.—M. Eastham
V. Pres.—E. H. Locke
Engrg. Mgr.—C. T. Burke
Sales Mgr.—H. B. Richmond
Comm. Engrg. Mgr.—A. E. Thiessen

General Tire & Rubber Co., Englewood Ave., Akron, Ohio
Pres.—William O'Neil
V. Pres.—C. Jahant
Ch. Engr.—Robert Iredell
Sales Mgr.—L. A. McQueen

Gerlach Co., E. A., 3567 Sepviva St., Philadelphia, Pa.
Pres.—Richard G. Gerlach
Sec.—E. A. Gerlach
Sales Mgr.—T. Walker Cleeland

Gilbert & Barker Mfg. Co., Springfield, Mass.

Gillies Aviation Corp., Bethpage, N. Y.
Pres.—John W. Gillies, Jr.
V. Pres. Chg. Export Sales—Gilbert C. Greenway

Glidden Co., 11100 Glidden Ave., Cleveland, Ohio

Goddell Pratt Co., Greenfield, Mass.

Goetze Gasket & Packing Co., New Brunswick, N. J.

G & O Mfg. Co., 138 Winchester Ave., New Haven, Conn.
Pres.—Anthony J. Verdi
V. Pres.—Vincent Carangelo
Ch. Engr.—J. J. Curello

Goodrich Co., B. F., 500 S. Main St., Akron, Ohio
Pres.—John L. Collyer
V. Pres.—J. J. Newman
V. Pres.—J. H. Connors
V. Pres.—T. G. Graham
Gen Sales Mgr.—G. E. Brunner
Mgr. Aeronautical Sales—J. S. Pedler
Aeronautical Research—W. H. Hunter
Airplane Tire Designer—H. F. Schippel

Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, Ohio
Pres.—P. W. Litchfield
V. Pres.—E. J. Thomas
V. Pres. & Sales Mgr.—R. S. Wilson
Mgr. Govt. Sales & Aeronautics—V. R. Jacobs
Mgr. Airplane Div., Aeronautics Dept.—L. O. Guinther

Goulds Pumps, Inc., 240 Fall St., Seneca Falls, N. Y.

Gould Storage Battery Corp., 35 Neoga St., Depew, N. Y.
Pres.—A. H. Daggett
V. Pres.—Herbert King
Sales Mgr.—J. C. Sykora

Govro-Nelson Co., 1931 Antoinette St., Detroit, Mich.

Greenfield Tap & Die Corp., Greenfield, Mass.

Grimes Mfg. Co., Urbana, Ohio

Grinnell Co., 277 W. Exchange St., Providence, R. I.

Grumman Aircraft Engineering Corp., Bethpage, N. Y.

Gulf Oil Corp., Gulf Bldg., Pittsburgh, Pa.
Mgr. Aviation Dept.—Major Al Williams

—H—

Hall-Aluminum Aircraft Corp., Radcliffe St., Bristol, Pa.
Pres.—Archibald M. Hall
V. Pres.—Charles F. Pape
Ch. Engr.—Samuel D. Weaver

Hamilton Standard Propellers, Div. of United Aircraft Corp., East Hartford, Conn.
Gen. Mgr.—Raycroft Walsh
Asst. Gen. Mgr. & Sales Mgr.—S. A. Stewart
Mgr. Engrg.—Frank W. Caldwell
Ch. Engr.—Erle Martin
Asst. Ch. Engr.—C. F. Baker
Asst. Sales Mgr.—Samuel P. Crago
Asst. Sales Mgr.—R. W. Russell
Service Mgr.—Carl F. Schory

Harrison Radiator Div., General Motors Corp., Lockport, N. Y.
Gen. Mgr.—F. M. Hardiman
Works Mgr.—D. B. Whitney
Gen. Sales Mgr.—L. J. Schneider
Ch. Engr. Prod. Engrg.—J. R. Holmes
Ch. Engr. Research Engrg.—L. P. Saunders
Chg. Heat Exchanger Dept.—R. Eberhardt

Hartford Machine Screw Co., 476 Capitol Ave., Hartford, Conn.

Hartshorn Stewart Co., 250 Fifth Ave., New York, N. Y.

Hartzell Propeller Fan Co., 1963 Shroyer Rd., Piqua, Ohio

Harvey Radio Laboratories, Inc., 25 Thorndike St., Cambridge, Mass.
Pres.—James B. Parker
V. Pres. & Ch. Engr.—Clifford A. Harvey
Sales Mgr.—Richard A. Mahler

Haskelite Mfg. Corp., 208 W. Washington St., Chicago, Ill.

Haskins, R. G., 4636 W. Fulton St., Chicago, Ill.

Hayes Industries, Inc., Jackson, Mich.
Pres.—C. B. Hayes
V. Pres.—Charles Hollerith
Ch. Engr.—W. H. Maxson

Haynes-Stellite Co., Harrison & Lindsay Sts., Kokomo, Ind.

Hays Corp., Michigan City, Ind.

Hazard Insulated Wire Works, Div. of The Okonite Co., Wilkes-Barre, Pa.

Hazard Wire Rope Div., American Chain & Cable Co., 230 Park Ave., New York, N. Y.

Heald Machine Co., 10 New Bond St., Worcester, Mass.
Pres.—Roger N. Heald

Heintz & Kaufman, Ltd., South San Francisco, Cal.
Plant Supt.—R. C. Shermund
Sales Mgr.—W. Noel Eldred

Heywood, Wakefield Co., Gardner, Mass.

Hill Aircraft Streamliners Co., 700 W. Sixth St., Cincinnati, Ohio
Pres.—John A. Hill
Ch. Engr.—W. A. Sundquist

Hobart Bros. Co., Hobart Square, Troy, Ohio
Pres. & Ch. Engr.—E. A. Hobart
V. Pres.—W. H. Hobart
Sales Mgr.—E. C. Galbreath
Plant Mgr.—O. H. Menke

Holley Carburetor Co., Vancouver Ave., Detroit, Mich.

Homestead Valve Mfg. Co., Coraopolis, Pa.
Pres.—W. R. Schuchman
V. Pres.—B. F. Schuchman
Engr.—F. W. Ofeldt
Sales Mgr.—F. E. Schuchman

Houde Engineering Corp., 537 E. Delavan Ave., Buffalo, N. Y.

Hoyt Electrical Instrument Works, 857 Boylston St., Boston, Mass.

Hubbell, Inc., Harvey, State St. & Bostwick Ave., Bridgeport, Conn.

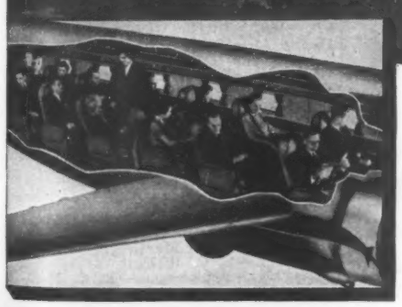
Hunter Mfg. Corp., Bristol, Pa.

BENDIX RADIO

BENDIX AIR RADIO NEWS

UARY 1940 Published by BENDIX RADIO CORPORATION, Baltimore, Md. Cable Address BENRAD

MID-CONTINENT'S NEW LODESTARS 100% BENDIX RADIO-EQUIPPED



Larger, More Comfortable, Faster, the 3 new Lockheed Lodestar Airliners purchased by Mid-Continent Airlines have a cruising speed of 220 m. p. h.—represent another step forward by this progressive Airline. These giant ships, with accommodations for 14 passengers and crew of 3, are equipped with the Bendix TA-2 8-channel, Transmitters, RA-2 and RA-4 Receivers, new MN-26 Compasses and the MM3 Static Cartridges.

New Fast Lockheeds Have Bendix Transmitters, Receivers, Compasses, Static Cartridges

To Fly New Tulsa, Kansas City, Omaha, Minneapolis Line

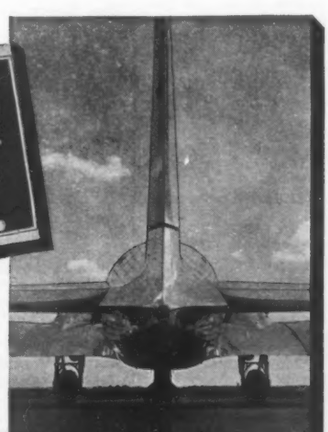
STATIC CARTRIDGE WINS PRAISE OF WELL-KNOWN PILOT

Captain M. B. Freeburg of the Northwest Airlines describes an interesting experience with the Bendix Static Cartridge: "During the past year I have had the opportunity of releasing several Bendix Static Cartridges under various conditions and have found them in all cases very effective. To cite an individual case, on last Dec. 5th (1939), I was flying trip eight to Chicago under instrument conditions. About an hour out of Minneapolis I was flying in a mixture of snow and rain resulting in severe static completely obliterating radio reception. A corona was existant around the propellers and the trailing edge of the wings in varying amounts up to two foot trailers. Thirty seconds after releasing a Static Cartridge, the corona disappeared and the reception was perfect."

(*Signed*) CAPTAIN M. B. FREEBURG
Northwest Airlines, Inc.

Cartridge Easily Reloaded between flights in a few moments.

Control Panel mounted in cockpit. A touch of the switch releases a cone which extends a trailing discharge wire. A resistor prevents oscillatory discharge and insures quiet radio reception. Pilot lights on the panel indicate whether Cartridge is in holder or has been released.



Release Mechanism of cartridge is installed in tail of plane and is controlled from the flight cockpit.

—I—

Ideal Clamp Mfg. Co., 200 Bradford St., Brooklyn, N. Y.
Pres. & Sales Mgr.—Phil Rauch
Ch. Engr.—Louis J. Rauch

Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago, Ill.

Imperial Brass Mfg. Co., 511 S. Racine Ave., Chicago, Ill.

Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill.
Pres.—Neil C. Hurley
V. Pres. & Sales Mgr.—W. A. Nugent
V. Pres.—F. B. Hamerly
V. Pres.—N. C. Hurley, Jr.
Ch. Engr.—F. B. Forss

Industrial Engineering & Mfg. Co., 239 John St., Bridgeport, Conn.

Ingas Co., 1201 Hudson St., Hoboken, N. J.

Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

International Derrick & Equipment Div., International-Stacey Corp., 875 Michigan Ave., Columbus, Ohio

International Flare-Signal Div., Kilgore Mfg. Co., Tipp City, Ohio
Pres.—W. L. Payne
V. Pres.—A. F. Hubbard
Ch. Engr.—L. L. Driggs, Jr.

International Harvester Co., 180 N. Michigan Ave., Chicago, Ill.
Pres.—S. G. McAllister
V. Pres.—M. F. Holahan
Ch. Engr.—L. B. Sperry
Sales Mgr.—W. F. McAfee

International Nickel Co., 67 Wall St., New York, N. Y.

International-Stacey Corp., 875 Michigan Ave., Columbus, Ohio

International Telephone Development Co., 137 Varick St., New York, N. Y.
Pres.—W. H. Pitkin
V. Pres.—H. H. Buttner
Sales Mgr.—George Lewis
Adv. Mgr.—A. M. MacLennan

Irving Air Chute Co., 1670 Jefferson Ave., Buffalo, N. Y.

—J—

Jadson Motor Products Co., 8354 Wilcox Ave., Bell, Cal.
V. Pres.—P. D. Hileman
Ch. Engr.—R. M. Rogers
Sales Mgr.—W. H. Carhart
Supt.—V. E. Kangas

Jaeger Watch Co., 304 E. 45th St., New York, N. Y.
Pres.—Edgar L. Vail
Ch. Engr.—Jo Berge

Johns-Manville, 22 E. 40th St., New York, N. Y.
Pres.—Lewis H. Brown
V. Pres.—T. K. Mial
V. Pres.—J. H. Trent

Johnson Airplane & Supply Co., Dayton, Ohio

Johnson & Faulkner, Inc., 45 E. 53d St., New York, N. Y.
Pres.—Louis F. Timmerman
Sales Mgr.—Benjamin H. Andrews

Johnson & Johnson, New Brunswick, N. J.

Johnson-National Insignia Co., 314 W. 14th St., New York, N. Y.

J. V. W. Corp., 1100 Raymond Blvd., Newark, N. J.
Pres.—C. S. Jones
V. Pres.—Lee D. Warrender
V. Pres.—Richard Whatham
Treas.—Geo. A. Vaughn, Jr.

—K—

Kelite Products, Inc., 909 E. 60th St., st., Los Angeles, Cal.

Kellogg Switchboard & Supply Co., 1066 W. Adams St., Chicago, Ill.

Kendall Refining Co., 77 N. Kendall Ave., Bradford, Pa.

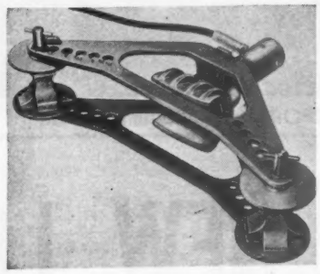
Kenwood Mills, Albany, N. Y.

Kerite Insulated Wire & Cable Co., 30 Church St., New York, N. Y.

Kidde & Co., Walter, 140 Cedar St., New York, N. Y.
Pres.—Walter Kidde
V. Pres.—Walter H. Freygang
Ch. Engr.—John Mapes
Sales Mgr.—C. L. Griffin

Kilgore Mfg. Co. (International Flare Signal Div.), Tipp City, Ohio
Pres.—W. L. Payne
V. Pres.—A. F. Hubbard
Ch. Engr.—R. L. Driggs, Jr.

Kirkham Engrg. & Mfg. Corp., Farmingdale, N. Y.
Pres.—Robert Simon
Ch. Engr.—Dwight Chester
Sales Mgr.—George H. Hauser



Porto-Power Pipe and Conduit Bender —Blackhawk Mfg. Company

Klauer Mfg. Co., Ninth & Washington Sts., Dubuque, Iowa
Pres. & Sales Mgr.—W. E. Klauer
Ch. Engr.—C. L. Ostrander

Kollsman Instrument Div., Square D Co., 8008 45th Ave., Elmhurst, N. Y.
Pres.—F. W. Magin
V. Pres. & Ch. Engr.—Paul Kollsman
Sales Mgr.—Wesley C. Bonn

Koppers Co., American Hammered Piston Ring Div., Bush & Hamburg Sts., Baltimore, Md.

—L—

Laidlaw Co., 16 W. 60th St., New York, N. Y.
Pres.—William R. Laidlaw

Lakewood Engineering Co., 520 Dublin Ave., Columbus, Ohio

Laminated Shim Co., 21-24 44th Ave., Long Island City, N. Y.
Pres.—C. N. Aborn
Sales Mgr.—Richard Seipt
Factory Mgr.—E. L. Young

Landers, Frary & Clark, 47 Center St., New Britain, Conn.

Leach Relay Co., 5915 Avalon Blvd., Los Angeles, Cal.

Lear Aviation, Inc., Vandalia, Ohio

Lear Developments, Inc., 24 State St., New York, N. Y.

Leeds & Northrup Co., 4918 Stenton Ave., Philadelphia, Pa.

Lenz Electric Mfg. Co., 1759 N. Western Ave., Chicago, Ill.

Lewis Engineering Co., Naugatuck, Conn.
Pres.—Harris Whittemore, Jr.
V. Pres.—C. S. Ham
Sales Mgr.—C. W. Pepperman

Libbey-Owens-Ford Glass Co., 606 Madison St., Toledo, Ohio

Lights, Inc., 1107 S. Fremont Ave., Alhambra, Cal.
Pres.—Thayer Thorndike
V. Pres.—V. Osburne
Ch. Engr.—B. Williams
Sales Mgr.—W. R. Lightbody

Linde Air Products Co., Unit of **Union Carbide & Carbon Corp.**, 30 East 42nd St., New York, N. Y.

Liquidometer Corp., 36-16 Skillman Ave., Long Island City, N. Y.
Pres. & Ch. Engr.—C. A. DeGiers
V. Pres. & Sales Mgr.—H. T. Cullinan

Lisle Corp., 807 E. Main St., Clarinda, Iowa
Pres.—C. V. Lisle
V. Pres.—J. Read Arthur
Ch. Engr.—T. E. Brooks
Sales Mgr.—A. A Cambre

Littelfuse, Inc., 4757 Ravenswood Ave., Chicago, Ill.
Pres.—E. V. Sundt
V. Pres. Chg. Prod.—B. Kollath

Lobdell-Emery Mfg. Co., Alma, Mich.

Lord Mfg. Co., 1635 W. 12th St., Erie, Pa.

Lowe Brothers Co., 528 E. Third St., Dayton, Ohio
Pres.—D. A. Kohr
V. Pres.—C. W. Panott
Ch. Engr.—B. Hanson
Sales Mgr.—C. H. Hampton

Lumen Bearing Co., 198 Lathrop St., Buffalo, N. Y.

Lunkenheimer Co., Beekman St. & Waverly Ave., Cincinnati, Ohio
Pres.—E. H. Lunken
V. Pres.—David C. Jones
Ch. Engr.—J. J. Aull
Sales Mgr.—H. A. Burdorf
Aircraft Sales—Charles E. Wood

Lycoming Div., Aviation Mfg. Corp., Williamsport, Pa.
Pres.—W. H. Beal
V. Pres.—A. I. Lodwick
Ch. Engr.—S. K. Hoffman
Sales Mgr.—R. E. Palmer

—M—

Mac Whyte Co., 2935 14th Ave., Kenosha, Wis.

Magnus Chemical Co., South Ave., Garwood, N. J.
Pres.—W. M. Campbell
V. Pres. Chg. Prd.—R. W. Mitchell
V. Pres. Ch. Sales—D. Blanchard

Magosy & Buscher, 120 Walker St., New York, N. Y.

Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., 61 Willett St., Passaic, N. J.

Manley Mfg. Div., American Chain & Cable Co., York, Pa.

Marlin-Rockwell Corp., 402 Chandler St., Jamestown, N. Y.

Marshall-Fahlin Propeller Co., Marshall, Mo.

Marvel-Schebler Carburetor Div., Borg-Warner Corp., Flint, Mich.
Gen Mgr.—S. W. Gray
Ch. Engr.—J. R. Emerson
Service Sales Mgr.—N. M. Hurry

Maryland Metal Building Co., Race & McComas Sts., Baltimore, Md.
Pres., Ch. Engr. & Sales Mgr.—C. H. Michel
V. Pres.—Osborne Murphy

Massachusetta Mohair Plush Co., 3701 N. Broad St., Philadelphia, Pa.
Pres.—H. M. Bliss
V. Pres. & Sales Mgr.—J. E. Duval
Ch. Engr.—R. B. Houghton

Maynard-Di Cesare Propeller Corp., Milwaukee County Airport, Cudahy, Wis.

McArthur Corp., Warren, 1 Park Ave., New York, N. Y.
Pres.—Warren McArthur
V. Pres.—Harmon L. Lewis
Treas.—P. Erich Plehn
Sec.—Otto Crouse

McCauley Steel Propeller Co., 2901 W. Third St., Dayton, Ohio
Pres.—E. G. McCauley
Sec. & Sales Mgr.—C. R. Heberling

McCord Radiator & Mfg. Co., 2587 E. Grand Ave., Detroit, Mich.

Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.

Merrimac Chemical Co., Everett Station, Boston, Mass.

Met-L-Wood Corp., 6755 W. 65th St., Chicago, Ill.
Pres.—C. C. Kendrick
V. Pres.—L. M. Crow, Jr.
Ch. Engr.—G. K. Lewis

Micro Switch Corp., Freeport, Ill.

Milburn Co., Alexander, 1439 W. Baltimore St., Baltimore, Md.
Pres.—Alexander F. Jenkins
V. Pres.—Walter K. Dow

Milford Rivet & Machine Co., Milford, Conn.

Millers Falls Co., Greenfield, Mass.
Pres.—Philip Rogers
V. Pres. & Sales Mgr.—Geo. U. Hatch

Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh, Pa.
Pres.—J. T. Ryan
V. Pres.—J. F. Beggy
Sales Mgr.—J. B. Davies

Modine Mfg. Co., 101 Park Ave., New York, N. Y.

Molded Insulation Co., 335 E. Price St., Philadelphia, Pa.
Pres.—Victor I. Zelov
V. Pres.—Albert Heer
Ch. Engr.—J. Aichinger

Moto Meter Gauge & Equipment Div., Electric Auto-Lite Co., Champlain & Mulberry Sts., Toledo, Ohio

Motor Improvements, Inc., 365 Frelinghuysen Ave., Newark, N. J.
Pres.—J. A. Graham
V. Pres.—R. R. Layte
Ch. Engr.—L. Williams
Asst. Gen. Sales Mgr.—W. M. Kane

Murphy Varnish Co., 224 McWhorter St., Newark, N. J.

—N—

National Aircraft Materials Corp., Rutland, Vt.
Pres. & Sales Mgr.—Perley R. Eaton
V. Pres. & Sec.—Leon E. Eaton
Treas. & Ch. Engr.—Mark J. Eaton

National Battery Co., 1728 Roblyn St., St. Paul, Minn.

National Carbide Sales Corp., 60 E. 42nd St., New York, N. Y.

National Tube Co., Frick Bldg., Pittsburgh, Pa.

New Departure, Div. of General Motors Sales Corp., Bristol, Conn.
Ch. Engr.—T. C. D. Crow
Sales Mgr.—L. G. Sigourney
Gen. Mgr.—F. G. Hughes

New Haven Clock Co., 133 Hamilton St., New Haven, Conn.

Norma-Hoffmann Bearings Corp., Stamford, Conn.
Pres.—O. P. Wilson
V. Pres. & Sales Mgr.—H. J. Ritter
Ch. Engr.—D. E. Batesole

Northill Co., Inc., 6824 McKinley Ave., Los Angeles, Cal.
Pres.—Blanche W. Hill
V. Pres.—W. C. Brownlee
Ch. Engr.—John K. Northrop
Sales Mgr.—Ed. Zuchelli

—O—

Oakite Products, Inc., 22 Thames St., New York, N. Y.
Pres.—D. C. Ball
V. Pres.—Paul B. Scarff
Asst. Mgr.—J. A. Carter
Chemical Engr.—H. L. Gray

Ohio Piston Co., 5337 St. Clair Ave., Cleveland, Ohio
Pres.—C. Birnbaum
V. Pres.—E. Gutman
Ch. Engr.—Geo. Svetcoff
Sales Mgr.—Dan P. Shaw

Ohio Seamless Tube Co., Shelby, Ohio
Pres.—W. C. Connelly
V. Pres.—W. W. Van Horn
Ch. Engr.—R. E. Dewey
Sales Mgr.—A. Waines, Jr.
Asst. Sales Mgr.—R. A. Campbell

Onan & Sons, D. W., 43-51 Royalston Ave., Minneapolis, Minn.
Pres.—D. W. Onan
V. Pres. & Ch. Engr.—C. W. Onan
Sales Mgr.—O. E. Linquist
Pur. Agt.—H. F. Jacobsen

Ort, Karl, 614 W. Poplar St., York, Pa.

—P—

Paasche Airbrush Co., 1909 Diversey Pkwy., Chicago, Ill.
Pres.—J. A. Paasche
V. Pres.—H. F. Reck
Ch. Emgr.—Eugene Berg

Pacific Airmotive, Union Air Terminal Burbank, Cal.
Gen. Mgr.—Earl R. Herring
Branch Mgr.—E. B. Anderson
Service Mgr.—S. W. Wilson, Jr.
Sales Mgr.—K. R. Jameson

Pacific Scientific Co., Aeronautical Div., 1206 Maple Ave., Los Angeles, Cal.
Pres.—W. P. Balderston
V. Pres.—D. G. McAllister
Ch. Engr.—J. R. Harkness

Packard Electric Div., General Motors Corp., Warren, Ohio
Gen. Mgr.—B. N. MacGregor
Ch. Engr.—L. C. Wolcott
Sales Mgr. Replacement—R. I. Montgomery
Sales Mgr. Equipt.—G. S. Carr

Page Fence Association, 929 Connecticut Ave., Bridgeport, Conn.

Palnut Co., 58 Cordier St., Irvington, N. J.
Pres.—J. R. Hotchkin
V. Pres.—A. H. Beggs

Paramount Aircraft Products, Inc., 79 White St., New York, N. Y.
Pres.—Jacob Billig
V. Pres., Ch. Engr. & Sales Mgr.—Philip J. Billig

Paramount Welded Aluminum Products Corp., 314 39th St., Brooklyn, N. Y.

Park Drop Forge Co., 755 E. 79th St., Cleveland, Ohio
Pres.—George C. Gordon
Ch. Engr.—William A. Humel
Sec. & Treas.—Fred L. Ball

Parker Appliance Co., 17325 Euclid Ave., Cleveland, Ohio

Parker-Kalon Corp., 200 Varick St., New York, N. Y.
Dir. of Sales & Adv.—Chas. S.Trott
Asst. Sales Mgr.—S. S. Kahn

Paxton Lumber Co., Frank, 45 Kansas St., Kansas City, Kan.

Pennsylvania Flexible Metallic Tubing Co., 7215 Powers Lane, Philadelphia, Pa.

The CURTISS P-40 *of 1940*

Seventeen years ago, Curtiss built the first pursuit airplanes for the U. S. Army Air Corps. Refined and improved each year, they were soon designated as Curtiss Hawks and became famous for their speed and maneuverability. Curtiss Pursuits have been in continuous service ever since.

During 1940 large quantities of the Curtiss P-40 Advanced Pursuit type will roll off the production lines to augment the famous P-36A type now in service and strengthen the Air Arm of our government's National Defense program.

The current Curtiss P-40 contract, representing the largest unit order for aircraft ever placed by the U. S. Government in peace time, is scheduled to be completed in record time.

CURTISS AEROPLANE DIVISION
CURTISS-WRIGHT CORPORATION
Buffalo New York
"The Pioneers of Aviation"

Curtiss PRECISION-BUILT ARMY AND NAVY AIRCRAF

Pennzoil Co., Drake Bldg., Oil City, Pa.

Perfect Circle Co., Hagerstown, Md.
Pres.—Lothair Teetor
V. Pres. & Ch. Engr.—Ralph R. Teetor
Sales Mgr.—Don H. Teetor

Permatex Co., 1720 Ave. Y, Brooklyn, N. Y.
Pres.—C. A. Benoit
V. Pres.—L. C. Wills
Ch. Engr.—T. L. Camp
Sales Mgr.—H. J. Enders

Permutit Co., 330 W. 42d St., New York, N. Y.

Perry Austen Mfg. Co., Grasmere, N. Y.

Phillips Petroleum Co., Bartlesville, Okla.
Pres.—K. S. Adams
V. Pres. Chg. Sales—A. M. Hughes
Mgr. Aviation Dept.—William Parker

Phister Mfg. Co., 621 E. Pearl St., Cincinnati, Ohio

Phoenix Aircraft Products Co., Williamsville, N. Y.

Pioneer Instrument, Div. of **Bendix Aviation Corp.**, Bendix, N. J.
Gen. Mgr.—R. P. Lansing
Ch. Engr.—W. A. Reichel
Sales Mgr.—R. H. Isaacs

Pioneer Parachute Co., Manchester, Conn.
Pres.—Henry R. Mallory
V. Pres. & Ch. Engr.—J. Floyd Smith
V. Pres. & Sales Mgr.—Lyman H. Ford

Pittsburgh Plate Glass Co., Grant Bldg., Pittsburgh, Pa.
Pres.—H. S. Wherrett
V. Pres.—H. B. Higgins
V. Pres.—E. D. Griffin
Sales Mgr.—F. W. Judson

Pittsburgh Screw & Bolt Corp., 2719 Preble Ave., Pittsburgh, Pa.

Posey & Co., J. V. G., 1008 S. W. Sixth Ave., Portland, Ore.
Pres.—J. V. G. Posey

Pratt & Lambert, 73-97 Tonawanda St., Buffalo, N. Y.

Prest-O-Lite Battery Co., 4500 W. 16th St., Indianapolis, Ind.
Pres.—J. H. McDuffee
V. Pres.—H. E. Komitch
Ch. Engr.—N. E. Hehner
Service Mgr.—R. M. Worth

Protectoseal Co., 1920 S. Western Ave., Chicago, Ill.

Pump Engineering Service Corp., 12910 Taft Ave., Cleveland, Ohio
Pres.—D. E. Gamble
V. Pres. & Gen. Mgr.—R. H. McOuat
Ch. Engr.—J. M. Roth
Sales Mgr.—John Harding, Jr.

Pure Oil Co., 35 E. Wacker Drive, Chicago, Ill.
Pres.—H. M. Dawes
V. Pres.—C. B. Watson
Ch. Engr.—W. G. Clark
Sales Mgr.—C. W. Snider
Mgr. Aviation—D. H. Young

Pyle-National Co., 1334 N. Kostner Ave., Chicago, Ill.
Pres.—J. A. Amos
V. Pres.—L. A. Vilas
Ch. Engr.—T. E. McDowell
Sales Mgr.—W. A. Ross

Pyrene Mfg. Co., 560 Belmont Ave., Newark, N. J.
Pres.—E. A. Clapp
V. Pres. & Gen. Mgr.—E. J. Waring
V. Pres. & Sec.—E. G. Weed
Ch. Engr.—William Rea
Sales Mgr.—G. H. Boucher

—R—

Radio Frequency Laboratories, Inc., Boonton, N. J.
Pres.—Richard W. Seabury
V. Pres.—Richard W. Seabury, Jr.
Ch. Engr.—Lester R. Damon
Sales Mgr.—Edwin S. Seabury

Radiomarine Corp. of America, 75 Varick St., New York, N. Y.

Radio Navigational Instrument Corp., 500 Fifth Ave., New York, N. Y.

Radio Receptor Co., 251 W. 19th St., New York, N. Y.
Pres. & Sales Mgr.—Ludwig Arnson
V. Pres.—Hugo Cohn
Ch. Engr.—Everett D. Gibbs

Randolph Finishing Products Co., Carlstadt, N. J.
Pres.—W. G. Randolph

Ranger Radio Co., 10718 Inglewood Ave., Inglewood, Cal.

Ray Day Piston Corp., W. Warren & Walton Aves., Detroit, Mich.
Pres.—R. E. Day
Sales Mgr.—J. M. Ready

Raymond Mfg. Co., Div. **Associated Spring Corp.**, Corry, Pa.
Pres.—F. F. Barnes
V. Pres.—F. M. Raymond
Sales Mgr.—J. E. Mount
Factory Mgr.—E. W. Feldt

RCA Mfg. Co., Camden, N. J.
Pres.—G. K. Throckmorton
V. Pres.—R. Shannon
Ch. Engr.—L. M. Clement
Sales Mgr.—D. S. Little

Reading Batteries, Inc., Reading, Pa.
Pres.—D. R. Bomberger
Ch. Engr.—C. H. Allen
Sales Mgr.—J. T. Moore, Jr.

Republic Steel Corp., Republic Bldg., Cleveland, Ohio
Pres.—R. J. Wysor
V. Pres. Ch. Sales—N. J. Clarke
Ch. Engr.—C. A. Thayer
Gen. Sales Mgr.—N. W. Foy

Richfield Oil Corp. of New York, 19 W. 50th St., New York, N. Y.
Pres.—W. C. Burns
Sales Mgr.—G. P. MacDonald
Mgr. Prod. Dept.—R. J. Babor

Richland Auto Parts Co., Mansfield, Ohio
Ch. Engr. & Sales Mgr.—J. O. Crouse
Gen. Mgr., Sec. & Treas.—O. P. Crouse

Rieker Instrument Co., 1919 Fairmount Ave., Philadelphia, Pa.
Ch. Engr.—Ernest G. Rieker
Sales Mgr.—M. A. Rieker

Ritchie & Sons, Inc., E. S., 112 Cypress St., Brookline, Mass.

Robertson Co., H. H., Farmers Bank Bldg., Pittsburgh, Pa.
Pres.—H. H. Robertson
V. Pres.—W. S. Tallman
Ch. Engr.—G. W. Thomas
Sales Mgr.—F. C. Russell

Roebling's Sons Co., John A., 640 S. Broad St., Trenton, N. J.
Pres.—William A. Anderson
V. Pres.—J. M. Roebling
Ch. Engr.—U. Malmstrom
Gen. Sales Mgr.—C. C. Cooley

Rohm & Haas Co., 222 W. Washington Square, Philadelphia, Pa.
Pres.—Otto Haas
V. Pres.—E. C. B. Kirsopp
Ch. Engr.—D. A. Pierce
Sales Mgr. Plastics Dept.—D. S. Frederick

Romec Pump Co., 333 E. Bridge St., Elyria, Ohio
Gen. Mgr.—J. B. Brennan
Ch. Engr.—W. L. Davis

Rose Aviation Corp., 45 W. 45th St., New York, N. Y.

Russell Mfg. Co., Middletown, Conn.
Pres.—G. M. Williams
V. Pres.—C. J. Sherer
Ch. Engr.—R. E. Dowd
Sales Mgr.—C. E. Harwood
Asst. Sales Mgr.—L. B. Brainard

—S—

Schrader's Son, A., Div. **Scovill Mfg. Co.**, 470 Vanderbilt Ave., Brooklyn, N. Y.

Schumacher & Co., F., 60 W. 40th St., New York, N. Y.

Scintilla Magneto Div., Bendix Aviation Corp., Sherman Ave., Sidney, N. Y.
Gen. Mgr.—H. Hanni
Ch. Engr.—W. J. Spengler
Sales Mgr. Aircraft—T. Z. Fagan

Scovill Mfg. Co., 99 Mill St., Waterbury, Conn.
Pres. & Gen. Mgr.—J. H. Goss
V. Pres. & Treas.—L. P. Sperry
Sales Mgr.—E. S. Sanderson

Seabury, Inc., New Brunswick, N. J.
Pres.—R. T. Bogan
V. Pres. & Sales Mgr.—Anton Ast

Sealed Power Corp., Muskegon, Mich.

Seaman Paper Co., 410 N. Michigan Ave., Chicago, Ill.
Pres.—C. W. Sherman
Gen. Mgr. & Treas.—A. J. Drusch

Seamlex Co., 5-19 48th Ave., Long Island City, N. Y.
Pres.—F. Jacobson

Sensenich Brothers, Lititz, Pa.
Partner—Harry M. Sensenich
Partner—Martin M. Sensenich
Ch. Engr.—Harold R. Uhrich

Service Steel Co., 1435 Franklin St., Detroit, Mich.

Shakeproof Lock Washer Co., 2501 N. Keeler Ave., Chicago, Ill.
Pres.—H. B. Smith
V. Pres.—F. W. England
Ch. Engr.—Carl G. Olson
Sales Mgr.—E. W. Fuller
Sales Engr.—J. B. O'Connor

Shakespeare Products Co., 417 N. Pitcher St., Kalamazoo, Mich.
Pres.—Henry G. Shakespeare
V. Pres.—Wm. G. Balz
Ch. Engr.—Herman H. Weber
Sales Mgr.—Donald E. Wallace

Shell Oil Co., Shell Bldg., St. Louis, Mo.
Pres.—Alexander Fraser
V. Pres.—F. A. C. Guepin
V. Pres.—P. E. Lakin
Gen. Sales Mgr.—R. H. Erichsen
Mgr. Aviation Dep't.—J. H. Doolittle

Shell Bldg., 50 W. 50th St., New York, N. Y.
Mgr. Aviation Dep't.—M. Hamon

Shell Bldg., 100 Bush St., San Francisco, Cal.
Mgr. Aviation Dept.—R. M. Adamson

Shell Petroleum Corp., Shell Bldg., St. Louis, Mo.

Shelton Looms, 1 Park Ave., New York, N. Y.

Sherwin-Williams Co., 101 Prospect Ave., N. W., Cleveland, Ohio

Shinn Devices Co., Pittsburgh-Butler Airport, Butler, Pa.
Pres. & Ch. Engr.—Byron H. Shinn

Shore Instrument & Mfg. Co., 90-25 Van Wyck Blvd., Jamaica, N. Y.

Siebenthaler, Thos. L., Mfg. Co., Division of **Aircraft Accessories Corp.**, 410 W. 6th St., Kansas City, Mo.
Pres.—Ted Lynn
V. Pres.—Edward Burke
Ch. Engr.—Preston Tanner
Sales Mgr.—R. A. Van Cleve

Simmonds Aerocessories, Inc., 551 Fifth Ave., New York, N. Y.
Gen. Mgr.—William R. Enyart

Simplex Electric Co., Route 11, Indianapolis, Ind.

Simplex Products Corp., 3830 Kelley Ave., Cleveland, Ohio
Pres.—D. M. Solenberger
V. Pres.—F. G. Ferguson
Ch. Engr.—R. C. Thompson
Sales Mgr.—W. J. Phillips

Sinclair Refining Co., 630 Fifth Ave., New York, N. Y.

SKF Industries, Front St. & Erie Ave., Philadelphia, Pa.

Skilsaw, Inc., 3310 Elston Ave., Chicago, Ill.

Skyview Camera Co., Municipal Airport, Cleveland, Ohio

S & M Lamp Co., 119 W. 36th Pl., Los Angeles, Cal.

Smith Welding Equipment Corp., Minneapolis, Minn.

Snyder & Son, M. L., Jasper & York Sts., Philadelphia, Pa.

Socony-Vacuum Oil Co., 26 Broadway, New York, N. Y.
Domestic Mgr.—H. W. Lake

Solar Aircraft Co., Lindbergh Field, San Diego, Cal.
Pres.—Edmund T. Price
V. Pres. & Sales Mgr.—A. A. Mathewson, Jr.
V. Pres.—C. S. Martso
V. Pres.—L. E. Wheeler
Ch. Engr.—J. P. Seamons

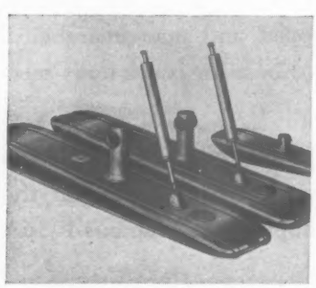
South Bend Air Products, Inc., 322 E. Colfax Ave., South Bend, Ind.

South Bend Lathe Works, 425 E. Madison St., South Bend, Ind.
Chairman Board—J. J. O'Brien
Pres. & V. Pres.—R. E. Frushour
V. Pres.—H. A. Smith

Spaulding Fibre Co., 310 Wheeler St., Tonawanda, N. Y.

Specialty Products Div. Western Electric Co., 300 Central Ave., Kearny, N. J.
Mgr.—F. R. Lack
Asst. Sales Mgr.—H. N. Willets
Marine & Aviation Sales—F. C. McMullen

Sperry Gyroscope Co., Manhattan Bridge Plaza, Brooklyn, N. Y.
Pres.—R. E. Gillmor
V. Pres & Ch. Engr.—Preston R. Bassett
V. Pres. & Sales Mgr.—Robert B. Lea



Metal Streamline Skiis—Federal Aircraft Works

Spray Engineering Co., 114 Central St., Somerville, Mass.

Stanavo Specification Board, 225 Bush St., San Francisco, Cal.

Standard Oil Co. (Indiana), 26 Broadway, New York, N. Y.

Standard Oil Co. of California, 225 Bush St., San Francisco, Cal.
Mgr. Aviation Div.—R. F. Bradley

Standard Oil Co. of Louisiana—see Esso Marketers

Standard Oil Co. of New Jersey—see Esso Marketers

Standard Oil Co. of Pa.—see Esso Marketers

Stanley Works, New Britain, Conn.

Star Compass Co., E. Milton, Mass.

Starrett Co., L. S., Athol, Mass.

Steel Products Engineering Co., Cor. Dakota Ave. & Columbia St., Springfield, Ohio

Stempel Fire Extinguisher Mfg. Co., 20th & Ferry Sts., St. Louis, Mo.

Stewart Iron Works Co., Seventh & Madison Sts., Covington, Ky.

Stewart Warner Corp., 1826 Diversey Pkwy., Chicago, Ill.

Story, Gawley Co., San Fernando Rd., Glendale, Cal.

Streeter-Amet Co., 4101 N. Ravenswood Ave., Chicago, Ill.
Pres.—H. G. Basquin

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Pres.—E. B. Freeman
Ch. Engr.—M. S. Leonard
Sales Mgr.—J. C. Thompson

Sullivan Machinery Co., 307 N. Michigan Ave., Chicago, Ill.

Summerill Tubing Co., Bridgeport, Pa.
Pres.—E. L. Parker
V. Pres.—R. R. Lawson
Sales Mgr.—J. P. Dods

Suncook Mills, 40 Worth St., New York, N. Y.
Pres.—W. Rodman Peabody
Gen. Mgr. & Treas.—J. Linzee Weld
Ch. Engr.—S. B. Potter
Sales Mgr.—Val Dietz, Jr.
Supt.—J. Raymond Fish
Ch. Technician—Osborne A. Simmons

Sundt Engineering Co., 4759 Ravenswood Ave., Chicago, Ill.

Swift Lubricator Co., Elmira, N. Y.

Switlik Parachute & Equipment Co., Jersey & Hancock Sts., Trenton, N. J.
Pres.—Stanley Switlik
V. Pres.—Walter Switlik
Ch. Engr.—Richard Switlik
Sales Mgr.—Wm. A. Schlegel

—T—

Taylor Instrument Companies, 100 Ames St., Rochester, N. Y.

Teicher Mfg. Corp., 136-23 34th Ave., Flushing, N. Y.

Templeton, Kenly & Co., 1020 S. Central Ave., Chicago, Ill.
Pres. & Sales Mgr.—J. B. Templeton
V. Pres.—Haig C. Dilsizian
Ch. Engr.—F. J. Jakoubek
Asst. Sales Mgr.—P. H. McManus

Texas Co., 135 E. 42d St., New York, N. Y.
Mgr. Sales—Aubrey Keif

Thiokol Corp., Yardville, N. J.

Thompson Products, Inc., 2196 Clarkwood Rd., Cleveland, Ohio
Pres.—F. C. Crawford
Senior V. Pres.—Lee M. Clegg
V. Pres.—Arch T. Colwell
Ch. Engr.—H. D. Bubb
Sales Mgr.—Geo. V. Sevald

Tide Water Associated Oil Co., 17 Battery Pl., New York, N. Y.

Timken Roller Bearing Co., 1900 Dueber Ave., Canton, Ohio
Pres.—William Umstattd
V. Pres. & Sales Mgr.—L. M. Klinedinst
Ch. Engr.—A. L. Bergstrom
Gen. Mgr. Steel Div.—H. H. Timken, Jr.
Sales Mgr. Steel Div.—W. B. Moore

Titanine, Inc., Morris & Elmwood Aves., Union, N. J.
Pres.—E. G. Davis
Sales Mgr.—Wm. A. Bagley

Titeflex Metal Hose Co., 500 Frelinghuysen Ave., Newark, N. J.
Pres.—C. W. Fletcher
V. Pres. & Sales Mgr.—Elbert E. Husted

Trane Co., 300 Cameron Ave., La Crosse, Wis.

Triangle Parachute Co., 1143 Harrison Ave., Cincinnati, Ohio
Pres.—Walter A. Draper

DESIGNED FOR **Fast Mass Production**

Developed with the splendid co-operation of the U. S. Army, and designed specifically for fast mass production, the Martin Model 167W combines in a high degree the three primary essentials of tactical utility—maneuverability, speed and fire power. A four-purpose military plane, it functions as a high-speed bomber, for long-range reconnaissance, for ground attack or as a twin-engine fighter, without sacrifice of the desirable characteristics of any of these types. Martin 167W is available for export. Correspondence is invited.

THE GLENN L. MARTIN COMPANY, BALTIMORE, MARYLAND U. S. A.

BUILDERS OF DEPENDABLE AIRCRAFT SINCE 1909

TRADE MARK

V. Pres.—Capt. Victor Heintz
Ch. Engr.—Col. E. L. Hoffman (Cal.)
Mgr.—C. L. Noelcke, Sr.

Trimm Radio Mfg. Co., 1770 W. Bearteau Ave., Chicago, Ill.

Truscon Steel Co., Youngstown, Ohio

Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Cal.
Pres.—S. G. Thornbury
Gen. Mgr.—Ray Sanders
Adv. Mgr.—Edgar Goldsmith

—U—

Union Carbide Co., 205 East 42nd St., New York, N. Y.

Union Drawn Steel Div., Republic Steel Corp., Massillon, Ohio
Mgr. Sales—F. C. Young
Asst. Mgr. Sales—L. I. Barkes

Union Parts Mfg. Co., 715 Sixth Ave., Brooklyn, N. Y.
Pres.—Ignatius Nurkiewicz
Treas.—Paul Nurkiewicz
Sec.—Macy Nurkiewicz

Union Special Machine Co., 400 N. Franklin St., Chicago, Ill.

Union Switch & Signal Co., 350 Fifth Ave., New York, N. Y.

United Aircraft Products, Inc., 480 Huffman Ave., Dayton, Ohio
Pres.—Harry L. Bill
V. Pres.—S. J. Sorensen
Ch. Engr.—R. G. Dykeman

United-Carr Fastner Corp., 31 Ames St., Cambridge, Mass.

United Metal Hose Co., 36-01 43d Ave., Long Island City, N. Y.

United States Air Compressor Co., 5300 Harvard Ave., Cleveland, Ohio

United States Fire Protection Co., 1201 Hudson St., Hoboken, N. J.

United States Electrical Tool Co., 2490 Riverside Drive, Cincinnati, Ohio
Pres.—J. C. Smith
Ch. Engr.—J. Radley
Sales. Mgr.—Geo. E. Smith

United States Gauge Co., 44 Beaver St., New York, N. Y.
Pres.—J. W. Place
Ch. Engr.—M. Klein
Sales Mgr.—W. G. Zeigler

United States Hammered Piston Ring Co., Stirling, N. J.

United States Plywood Corp., 616 W. 46th St., New York, N. Y.

United States Radiator Corp., 58-30 57th St., Maspeth, N. Y.

United States Radium Corp., 535 Pearl St., New York, N. Y.
Pres.—C. B. Lee
V. Pres.—J. E. Paul

United States Rubber Co., Mishawaka, Ind.
Gen. Mgr. Foam Div.—George W. Blair
Ch. Engr.—M. M. Cunningham
Sales Mgr.—K. L. Considine

United States Steel Corp., 71 Broadway, New York, N. Y.

Universal Alloy Products Corp., Lancaster, N. Y.
Pres. & Ch. Engr.—Earle M. Scott

Universal Microphone Co., Centinela at Warren Lane, Inglewood, Cal.

Utica Radiator Corp., 1841 Broadway, New York, N. Y.

—V—

Valentine & Co., 11 E. 36th St., New York, N. Y.
Pres.—Thurlow J. Campbell
V. Pres.—Frank P. Connolly
Ch. Engr.—Earnest A. Stoppel
Aero. Sales Mgr.—Arthur L. Clark

Van Dorn Portable Electric Tools, Div. of Black & Decker Mfg. Co., Towson, Md.

Variety Mfg. Co., 2901 W. Third St., Dayton, Ohio

Vellumoid Co., 54 Rockdale St., Worcester, Mass.
Pres.—Richard B. Stanley
V. Pres.—Richard D. Seamans
Ch. Engr.—L. Wald
Sales Mgr.—Charles S. Livingstone

Victor Mfg. & Gasket Co., 5750 Roosevelt Rd., Chicago, Ill.
Pres.—J. H. Victor
V. Pres.—A. A. Frymark
Ch. Engr.—R. S. Rainey
Sales Mgr.—C. C. Secrist

Viking Flying Boat Co., New Haven, Conn.

Vimalert Co., 807 Garfield Ave., Jersey City, N. J.
Pres.—Robert Cuse
V. Pres.—H. A. Schaufelberger

—W—

Wagner Electric Corp., 6400 Plymouth Ave., St. Louis, Mo.
Pres.—P. B. Postlethwaite
V. Pres.—A. H. Timmerman
Ch. Engr.—Burns Dick
Sales Mgr.—J. A. Gelzer

Wailes Dove-Hermiston Corp., 17 Battery Pl., New York, N. Y.

Walker Mfg. Co., Racine, Wis.
Pres.—J. S. Allan
V. Pres.—W. H. Walker
V. Pres. & Sales Mgr.—Malcolm McCormick
Ch. Engr.—J. J. Mizer
Asst. Sales Mgr.—G. R. Walker
Sales Prom. Mgr.—T. F. Hall

Waltham Watch Co., Waltham, Mass.
H. Masterson

Warner Aircraft Corp., 20263 Hoover Ave., Detroit, Mich.
Pres.—W. O. Warner
V. Pres. & Sales Mgr.—L. A. Faunce
V. Pres. & Ch. Engr.—L. A. Majneri

Washington Aircraft & Transport Corp., Boeing Field, Seattle, Wash.
Pres. & Sales Mgr.—A. Elliott Merrill
Ch. Engr.—Don Finley

Washington Institute of Technology, McLachlen Bldg., Washington, D. C.
Pres.—Sidney F. Mashbir
Ch. Engr.—Gomer L. Davies
Ch. Engr.—Dr. Frank G. Kear

Weatherhead Co., 300 E. 131st St., Cleveland, Ohio
Pres.—A. J. Weatherhead, Jr.
V. Pres.—John Cox
Ch. Engr.—Bert Carlson
Sales Mgr.—H. Church

Wellington Sears Co., 65 Worth St., New York, N. Y.

Western Electric Co., Specialty Products Div., 300 Central Ave., Kearny, N. J.
Mgr.—F. R. Lack
Asst. Sales Mgr.—H. N. Willets
Aviation Sales—F. C. McMullen

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Pres.—G. H. Bucher
V. Pres. Chg. Sales—Ralph Kelly
V. Pres. Chg. Engrg.—M. W. Smith
Ch. Engr.—R. E. Hellmund
Mgr., Transportation Sales Dept.—A. J. Manson

West Instrument Co., 39 Broadway, New York, N. Y.
Pres.—Francis West, Jr.
V. Pres.—Paul S. Zuckerman

Weston Electrical Instrument Corp., 578 Frelinghuysen Ave., Newark, N. J.

White Dental Mfg. Co., S. S., 10 East 40th St., New York, N. Y.

White, Kelvin & Wilfred O. Co., 90 State St., Boston, Mass.

Wiese & Co., William, 234 W. 56th St., New York, N. Y.

Wilcox-Rich Div., Eaton Mfg. Co., 9771 French Rd., Detroit, Mich.
Gen. Mgr.—R. H. Daisley
Ch. Engr.—V. C. Young
Sales Mgr.—H. G. Johnson

Wilkening Mfg. Co., 2000 S. 71st St., Philadelphia, Pa.
Pres.—F. W. Wilkening
Executive V. Pres.—George L. Briggs
Ch. Engr.—Paul Friend
Sales Mgr.—E. C. Chatfield

Willard Storage Battery Co., 246 E. 131st St., Cleveland, Ohio

Williams & Co., J. H., 400 Vulcan St., Buffalo, N. Y.

Willis & Geiger, Inc., 45 W. 27th St., New York, N. Y.
Pres.—Bertram Willis
V. Pres. & Sales Mgr.—Howard Geiger
Ch. Engr.—Philip Geiger
Prod. Mgr.—Lawson Stewart

Wolverine-Empire Refining Co., 51 Madison Ave., New York, N. Y.
Pres.—E. W. Chase
V. Pres.—F. W. Baer
V. Pres.—A. W. Scott
Ch. Engr.—A. T. von Schmid
Sales Mgr.—F. S. Smith

Wrought Washer Mfg. Co., 2223 S. Bay St., Milwaukee, Wis.

Wyman-Gordon Co., Worcester, Mass.
Pres.—H. G. Stoddard
V. Pres.—S. M. Havens
Ch. Engr.—J. H. Nelson
Sales Mgr.—F. E. Wellington
Works Mgr.—R. W. Stoddard

—Y—

Yale & Towne Mfg. Co., 548 Pacific St., Stamford, Conn.

Yoho & Hooker Lumber Co., 522 Williamson Ave., Youngstown, Ohio
Pres.—Jud Yoho
V. Pres.—D. E. Hooker

York Heating & Ventilating Corp., Philadelphia, Pa.

Young Radiator Co., 709 Marquette St., Racine, Wis.
Pres.—F. M. Young
V. Pres. & Sales Mgr.—J. J. Hilt
Ch. Engr.—W. V. Astrup

—Z—

Zapon Co., 60 E. 42d St., New York, N. Y.

Zenith Radio Corp., 6011 Dickens Ave., Chicago, Ill.

ACCESSORY DIRECTORY

Featuring aircraft and engine accessories, materials and parts, airport and shop equipment, and jobbers

AIRCRAFT ACCESSORIES

Armament
American Armament Corp.

Batteries
American Hard Rubber Co.
Burgess Battery Co.
Electric Storage Battery Co.
Gould Storage Battery Corp.
National Battery Co.
Prest-O-Lite Battery Co.
Reading Batteries, Inc.
Willard Storage Battery Co.

Cable, Control
Aircraft Steel & Supply Co.
American Chain & Cable Co.
American Steel & Wire Co.
Hazard Wire Rope Div. American Chain & Cable Co.
Richland Auto Parts Co.
Roebling's, Sons Co., John A.

Cameras and Supplies
Aero Service Corp.
Eastman Kodak Co.
Fairchild Aviation Corp.
Folmer Graflex Corp.
Skyview Camera Co.

Clothing
Willis & Geiger, Inc.

Compressors, Air
American Engineering Co.

Battery—Gould Storage Battery Corporation

Brunner Mfg. Co.
Chicago Pneumatic Tool Co.
Gould Pumps, Inc.
Ingersoll-Rand Co.
Romec Pump Co.
Sullivan Machinery Co.
United States Air Compressor Co.

Controls
Aircraft Accessories Corp.
Aircraft Development Co.
Aircraft Steel & Supply Co.
American Hard Rubber Co.
Arens Controls
Bloxham Aero Mfg. Co.
Breeze Corporations, Inc.
Northill Company, Inc.
Richland Auto Parts Co.
Shakespeare Products Co.
Simmonds Aerocessories, Inc.
Warner Aircraft Corp.

Equipment, Electrical
Air Radio
Anaconda Wire & Cable Co.
Boston Insulated Wire & Cable Co.
Breeze Corporations, Inc.
Cannon Electric Development Co.
Cutler-Hammer, Inc.
Eclipse Aviation Div., Bendix Aviation Corp.
Electrical Development Co.
Electric Specialty Co.
General Electric Co.
Heintz & Kaufman, Ltd.
Hubbell, Inc., Harvey,
Lenz Electric Mfg. Co.
Littlefuse, Inc.
Onan & Sons, D. W.

Storage Battery—Willard Storage Battery Co.

Packard Electric Div. General Motors Corp.
Pioneer Instrument Div. Bendix Aviation Corp.
Scintilla Magneto Div. Bendix Aviation Corp.
United Aircraft Products, Inc.

CONTRIBUTING TO AMERICAN SUPREMACY IN AVIATION

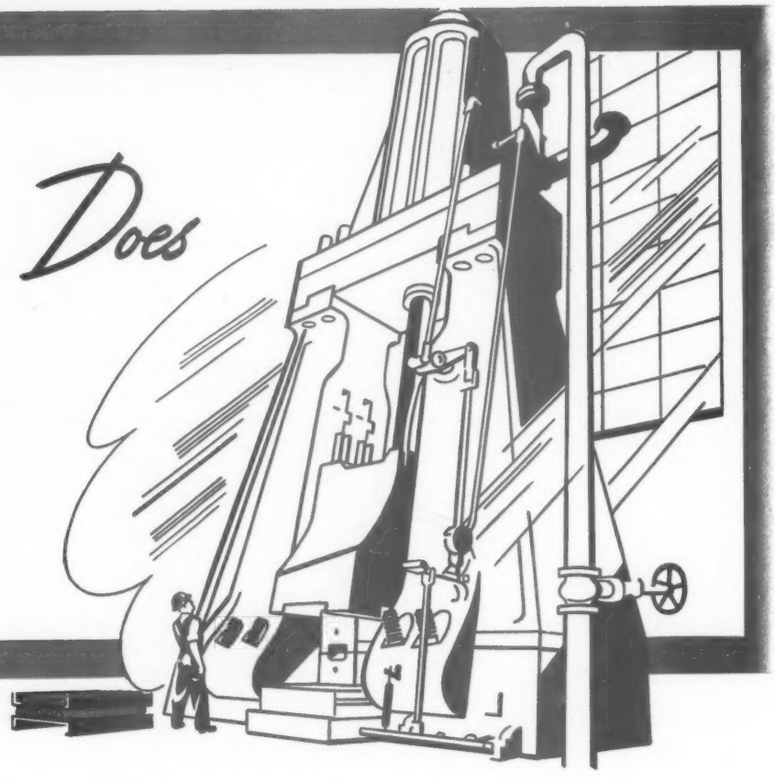
FLEETWINGS' Engineering has constantly kept pace with advancements in the Aviation Industry, continuously co-operating to further the progress and employment of Stainless Steel and Aluminum Alloy Surfaces in their steadily expanding applications, and also the development of Hydraulic Equipment.

Fleetwings reliability in engineering, workmanship and the maintenance of delivery schedules is meeting the exacting demands of both Civil and Military Aircraft Builders, and includes the production of Wings, Fixed and Movable Surfaces, Tanks, Fire Walls, Ammunition Boxes, Bomb Chutes, Hydraulic Equipment, Landing Gears, etc.

DESIGN • ENGINEERING
FABRICATION

FLEETWINGS
INCORPORATED
BRISTOL, PENNA.

It's what size *Does* that counts



IN OUR Cleveland plant has just been installed the largest forging hammer in America.

But the size, *per se*, is unimportant.

What does count is the way this hammer opens up new opportunities. From it are coming products forged from alloys of Alcoa Aluminum which definitely contribute to increased aircraft performance.

The purchase of this new hammer is a step in a complete, well-rounded program. The object of the program is to provide the most advanced production facilities, and extra research, for alloys of Alcoa Aluminum. What this continuing program *does*, of lasting value, is to help make aircraft, and aircraft production, more efficient, and more economical. Aluminum Company of America, 2182 Gulf Building, Pittsburgh, Pennsylvania.

ALCOA ALUMINUM

Westinghouse Electric & Mfg. Co.
Weston Electrical Instrument Corp.

Equipment, Lighting

Adams & Westlake
Air Radio
Anaconda Wire & Cable Co.
Boston Insulated Wire-Cable Co.
Breeze Corporations, Inc.
Corcoran-Brown Lamp Div., Electric Auto-Lite Co.
Dalco.
Grimes Mfg. Co.
Lights, Inc.
Pyle-National Co.
Roebling's Sons Co.
S & M Lamp Co.
Westinghouse Electric & Mfg Co.
United States Radium Corp.

Battery, Type IS-34—Reading Batteries Incorporated

Extinguishers, Fire

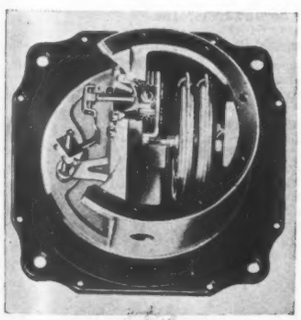
American-LaFrance-Foamite Corp.
C-O-Two Fire Equipment Co.
Flash Fire Extinguisher Co.
Fog Nozzle Co.
Kidde & Co., Walter
Phister Mfg. Co.
Pyrene Mfg. Co.

Flares

International Flare-Signal Div. Kilgore Mfg. Co.

Floats

Brewster Aeronautical Corp.
Edo Aircraft Corp.
Fleetwings, Inc.
Hall-Aluminum Aircraft Corp.
Kirkham Engineering & Mfg. Corp.
Northill Company, Inc.



Vapor-proof Manifold Pressure Indicator Mechanism—Pioneer Instrument Div., Bedixn Aviation Corp.

Goggles

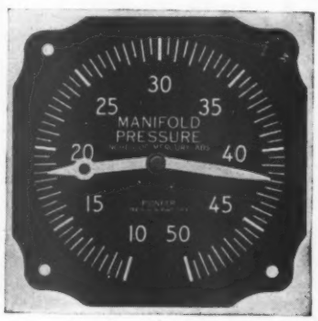
American Optical Co.

Instruments

Aero Instrument Co.
Aeromarine Instrument Co.
Aircraft Steel & Supply Co.
Air Radio
Air-Track Mfg. Corp.
American Paulin System
Barbour Stockwell Co.
Bausch & Lomb Optical Co.
Breeze Corporations, Inc.
Boston Auto Gage Co.
Burton-Rogers Co. (sole distributors)
Hoyt Elec. Inst. Wks.
Cambridge Instrument Co.
Chelsea Clock Co.
Cramer & Co., R. W.
Elgin National Watch Co.
Fairchild Aviation Corp.
Foxboro Co.
Friez & Sons, Julien P., Div. Bendix Aviation Corp.
General Electric Co., Incandescent Lamp Dept.
Hays Corp.
Hoyt Elec. Inst. Wks.
International Telephone Development Co.
Jaeger Watch Co.
Johnson National Insignia Co.
Kollsman Instrument Div., Square D Co.
Lear Aviation, Inc.
Leeds & Northup Co.
Lewis Engineering Co.
Liquidometer Corp.
Manning, Maxwell & Moore, Inc.
Moto Meter Gauge & Equipment Div. Electric Auto-Lite Co.
New Haven Clock Co.
Pacific Scientific Instrument Co. Aeronautical Div.
Permutit Co.
Pioneer Instrument Co. Div. of Bendix Aviation Corp.
Rieker Instrument Co.
Ritchie & Sons, Inc., E. S.
Shore Instrument & Mfg. Co.
Sperry Gyroscope Co.
Star Compass Co.
Sundt Engineering Co.
Taylor Instrument Companies
United States Gauge Co.
United States Radium Corp.
Waltham Clock Co.
Washington Institute of Technology
West Instrument Co.
Weston Electrical Instrument Corp.
Westinghouse Electric & Mfg. Co.
White, Kelvin & Wilfred O. Co.

Parachutes

Follmer Clogg Co.
Irving Air Chute Co.



Dual Manifold Pressure Indicator—Pioneer Instrument Div., Bendix Aviation Corp.

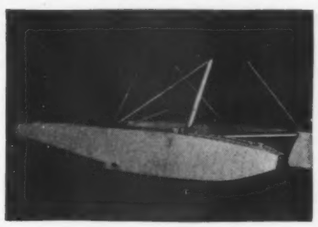
Pioneer Parachute Co.
Switlik Parachute & Equipment Co.
Triangle Parachute Co.

Propellers

Barkley-Grow Aircraft Corp.
California Propeller Co.
Curtiss-Wright Corp., Curtiss Propeller Div.
Engineering and Research Corp.
Everel Propeller Corp.
Fahlin Aircraft Co.
Flottorp Propeller Co.
Gardner Propeller Co.
Hamilton Standard Propellers, Div. United Aircraft Mfg. Corp.
Hartzell Propeller Fan Co., Div. of Hartzell Industries, Inc.
Lycoming Div. Aviation Mfg. Corp.
Marshall-Fahlin Propeller Co.
Maynard-Di Cesare Propeller Corp.
McCauley Steel Propeller Co.
Pittsburgh Screw & Bolt Corp.
Sensenich Brothers
South Bend Air Products, Inc.
Story, Gawley Co.

Radio

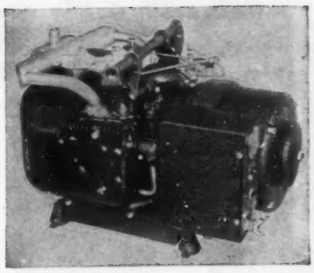
Aeronautical Radio Co.
Aerovoice, Inc.
Aircraft Accessories Corp.
Aircraft Radio Corp.
Air Radio
Airplane & Marine Direction Finder Corp.
Aircraft Radio Corp.
Air-Track Mfg. Corp.
Aladdin Radio Industries, Inc.
Bache Semon & Co.
Bendix Radio Corp.
Breeze Corporations, Inc.
Brush Development Co.
Cannon Electric Development Co.
Collins Radio Co.
Communication Development Corp.
Fairchild Aviation, Inc.
Fisher Research Laboratories Sales Co.
General Radio Co.
Harvey Radio Laboratories, Inc.
Heintz & Kaufman Ltd.
International Telephone Development Co.
J. V. W. Corp.
Lear Development, Inc.
Radiomarine Corp. of America
Radio Frequency Laboratories, Inc.
Radio Navigational Instrument Corp.
Radio Receptor Co.
Ranger Radio Co.
RCA Mfg. Co. Aviation Radio Section
Siebenthaler Mfg. Co., Thos. L.
Simplex Electric Co.
Specialty Products Div. Western Electric Co.
Sperry Gyroscope Co.
Trimm Radio Mfg. Co.
Washington Institute of Technology
Westinghouse Electric & Mfg. Co.



Edo "Standard" Float Installation—Edo Aircraft Corporation

Struts, Shock

Aircraft Development Co.
Bendix Products Div. Bendix Aviation Corp.
Cleveland Pneumatic Tool Co.
Fleetwings, Inc.
Hayes Industries, Inc.
Houde Engineering Corp.



Motor Generator Set—D. W. Onan & Sons

Industrial Engineering & Mfg. Co.
Russell Mfg. Co.
Thompson Products, Inc.
Warner Aircraft Corp.

Tires

Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.

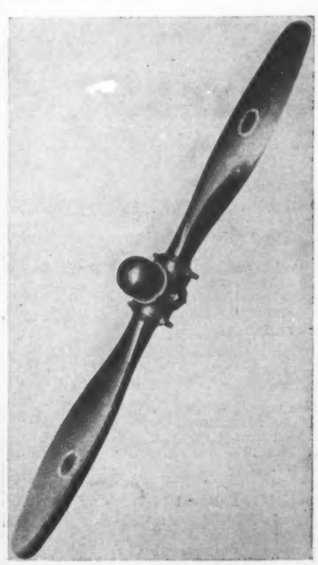
Wheels, Brakes and Skis

Air Transport Equipment
Bendix Products Div. Bendix Aviation Corp.
Dayton Wheel Co.
Engel Aircraft Specialties
Federal Aircraft Works
Firestone Tire & Rubber Co.
General Tire & Rubber Co.
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.
Hayes Industries, Inc.
Shinn Devices Co.
Universal Alloy Products Corp.
Variety Mfg. Co.
Wagner Electric Corp.
Warner Aircraft Corp.
Washington Aircraft & Transport Corp.

AIRPORT ACCESSORIES

Buildings

Allith-Prouty, Inc.
Austin Co.
Bethlehem Steel Co.
Blaw-Knox Co.
Columbian Steel Tank Co.
Cornell Iron Works, Inc.
International Derrick & Equipment Div. International-Stacey Corp.
Maryland Metal Building Co.
Robertson Co., H. H.
Trucson Steel Co.



2-blade Hydromatic Full Feathering Propeller—Hamilton-Standard Propellers, Div. of United Aircraft Corp.

Extinguishers, Fire

American-LaFrance-Foamite Corp.
Badger Fire Extinguisher Co.
C-O-Two Fire Equipment Co.
Flash Fire Extinguisher Co.
Fog Nozzle Co
Fyr-Fyter Co.
Garrison Engineering Co.
General Fire Truck Corp.
Ingas Co.
Kidde & Co., Walter
Phister Mfg. Co.
Pyrene Mfg. Co.
Snyder & Son, M. L.
Stempel Fire Extinguisher Mfg. Co.
Washington Aircraft & Transport Corp.

Fences

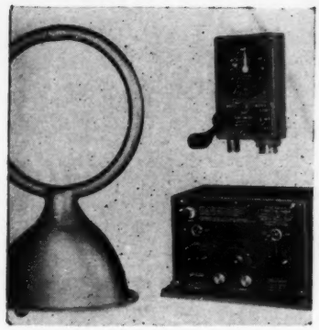
American Chain & Cable Co.
American Steel & Wire Co.
Anchor Post Fence Co.
Cyclone Fence Co.
Page Fence Assn.
Stewart Iron Works Co.

Heaters

Airtherm Mfg. Co.
American Blower Corp.
American Heating & Ventilating Co.
American Radiator Co.
Buffalo Forge Co.
Clarage Fan Co.
Cutler-Hammer, Inc.
Grinnell Co.
Ilg Electric Ventilating Co.
Modine Mfg. Co.
Sturtevant Co., B. F.
Trane Co.
United States Fire Protection Co.
United States Radiator Corp.
Utica Radiator Corp.
Westinghouse Electric & Mfg. Co.
York Heating & Ventilating Corp.

Kits and Supplies, First Aid

Bauer & Black
Bullard Co., E. D.
Burroughs Wellcome & Co.
Davis Emergency Equipment Co.
Johnson & Johnson
Mine Safety Appliances Co.
Seabury, Inc.
Snyder & Son, M. L.

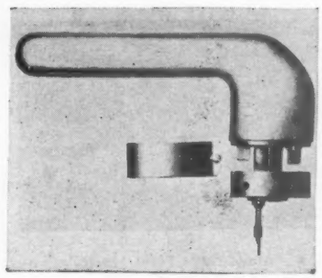


Direction Finding Accessories—Bendix Radio Corp.

Lights and Accessories
Air Associates, Inc.
Air Radio
Air-Ways Equipment Corp.
American Airport Equip. Co.
American Cable Div. American Chain & Cable Co.
American Gas Accumulator Co., Electrical Div.
Anaconda Wire & Cable Co.
Bartow Beacons, Inc.
B-B-T Corp. of America
Boston Insulated Wire & Cable Co.
Bull Dog Electric Products Co.
Claude Neon Lights, Inc.
Crouse-Hinds Co.
Cutler-Hammer, Inc.
General Cable Corp.
General Electric Co.
Hazard Insulated Wire Works Div. The Okanite Co.
Hunter Mfg. Corp.
Kellogg Switchboard & Supply Co.
Kerite Insulated Wire & Cable Co.
Lakewood Engineering Co.
Lights, Inc.
National Carbide Sales Corp.
Onan & Sons, D. W.
Pyle-National Co.
Roebling's Sons Co., John A.
Rose Aviation Corp.
Union Carbide Co.
United States Radium Corp.
Westinghouse Electric & Mfg. Co.

Radio
Aeronautical Radio Co.
Aerovoice, Inc.
Air Radio
Aircraft Accessories Corp.
Airplane & Marine Direction Finder Corp.
Air-Track Mfg. Corp.
Bendix Radio Corp.
Collins Radio Co.
General Radio Co.
Harvey Radio Laboratories, Inc.
Heintz & Kaufman, Ltd.
International Telephone Development Co.
Lear Developments, Inc.
Radio Frequency Laboratories, Inc.
Radio Receptor Co.
RCA Mfg. Co.
Siebenthaler Mfg. Co., Thos. L.
Specialty Products Div., Western Electric Co.
Universal Microphone Co.
Washington Institute of Technology
Westinghouse Electric & Mfg. Co.

Sprinklers
Grinnell Co.
Viking Flying Boat Co.



Electrically Heated Pilot Tube—Kollsman Instrument Div., Square D Co.

Systems, Fuel
Aqua Systems, Inc.
Bowser & Co., S. F.
Columbian Steel Tank Co.
Fink-Dumont-White, Inc.
Gilbert & Barker Mfg. Co.
Liquidometer Corp.
Lisle Corporation
Manhattan Rubber Mfg., Div. of Raybestos-Manhattan, Inc.
Motor Improvements, Inc.
Protectoseal Co.
Pump Engineering Service Corp.
Steel Products Engineering Co.
Swift Lubricator Co.
United States Fire Protection Co.
Yale & Towne Mfg. Co.

Tractors and Snow Removal Equipment
Baker Industrial Truck Co.
Baker Raulang Co.
Caterpillar Tractor Co.
Clark Tructractor, Div. Clark Equipment Co.
Cleveland Tractor Co.
Four Wheel Drive Auto Co.
International Harvester Co.
Klauer Mfg. Co.

Aircraft Beacon-Weather Receiver—Radio Corporation of America

Pistons and Rings
Aluminum Industries, Inc.
Duro Co.
Koppers Co., American Hammered Piston Ring Div.
Ohio Piston Co.
Perfect Circle Co.
Ray Day Piston Corp.
Sealed Power Corp.
Simplex Products Corp.
Thompson Products, Inc.
United States Hammered Piston Ring Co.
Wilkening Mfg. Co.

Radiators
G & O Mfg. Co.
Harrison Radiator Div. General Motors Corp.
McCord Radiator & Mfg. Co.
United Aircraft Products, Inc.
Young Radiator Co.

Shielding and Wiring
American Cable Co. Div. American Chain & Cable Co.
Belden Mfg. Co.
Boston Insulated Wire & Cable Co.
Breeze Corporations, Inc.
General Cable Corp.
Packard Electric Div. General Motors Corp.
Scintilla Magneto Div. Bendix Aviation Corp.
Titeflex Metal Hose Co.

Spark-Plugs
AC Spark Plug Co., General Motors Corp.
Aero Spark Plug Co.
B G Corp.
Breeze Corporations, Inc.
Champion Spark Plug Co.
Scintilla Magneto Div. Bendix Aviation Corp.

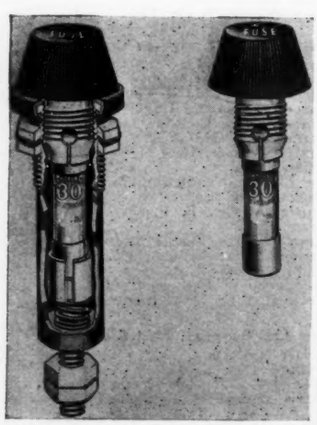
Starters
Aero Supply Mfg. Co.
Breeze Corporations, Inc.
Eclipse Aviation Div., Bendix Aviation Corp.
Federal Laboratories, Inc.
Leach Relay Co.

Systems, Fuel
Aircraft Steel & Supply Co.
Bendix Products Div. Bendix Aviation Corp.
Bowser & Co., S. F.
Breeze Corporations, Inc.
Cuno Engineering Corp.
Evans Appliance Co.
Fink-Dumont-White, Inc.
Fuel Development Corp.
Lunkenheimer Co.
Motor Improvements, Inc.
Protectoseal Co.
Pump Engineering Service Corp.
Romec Pump Co.
Steel Products Engineering Co.
Thompson Products, Inc.
United Aircraft Products, Inc.
Weatherhead Co.

Tanks
Aircraft Development Co.
Aluminum Co. of America.
Bethlehem Steel Co.
Breeze Corporations, Inc.
Engel Aircraft Specialties
Fink-Dumont-White, Inc.
Magosy & Buscher
Paramount Welded Aluminum Products Corp.

Valves
Aluminum Industries, Inc.
Jadson Motor Products Co.
Sealed Power Corp.
Thompson Products, Inc.
Weatherhead Co.
Wilcox-Rich, Div. of Eaton Mfg. Co.

ENGINE ACCESSORIES



Fuse Extractor Posts—Littlefuse Incorporated

Carburetors
Bendix Products Div. Bendix Aviation Corp.
Chandler-Evans Corp.
Holley Carburetor Co.
Marvel-Schebler Carburetor Div. Borg Warner Corp.
Zenith Radio Corp.

Filters, Intake
Air-Maze Corp.

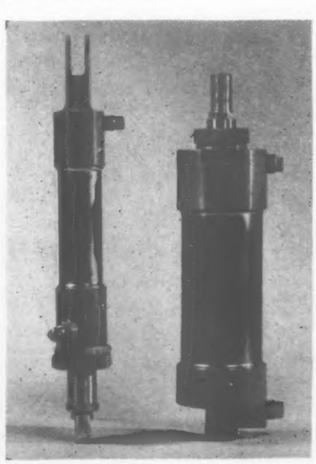
Ignition
American Bosch Corp.
Berling Magneto Co.
Molded Insulation Co.
Scintilla Magneto Div. Bendix Aviation Corp.

Manifolds, Exhaust
Aircraft Development Co.
American Tube Bending Co.
Brewster Aeronautical Corp.
Buhl Stamping Co
Davis Aircraft Co.
Engel Aircraft Specialties
Hill Aircraft Streamliners Co.
Solar Aircraft Co.

MATERIALS

Castings
Ampco Metal, Inc.
Ray Day Piston Corp. of Detroit

Compounds, Cleaning
American Chemical Paint Co.
Bendix Products Div. Bendix Aviation Corp.
Bravo Products Co.



Actuating Cylinders—Aircraft Accessories Corporation

Curran Corp.
Fink-Dumont-White, Inc.
Fischer's Surfa-Saver, Inc.
Ford Sales Co., J. B.
Gem Shine Products Co.
Gerlach Co.
Homestead Valve Mfg. Co.
Lowe Bros. Co.
Magnus Chemical Co.
Oakite Products, Inc.
Permatex Co.
Turco Products, Inc.

Fabrics (Decorative)
Chase & Co., L. C.
Collins & Aikman Corp.
Colvinex Corp.
du Pont de Nemours & Co., E. I.
Eagle-Ottawa Leather Co.
Johnson & Faulkner
Kenwood Mills
Laidlaw Co.
Massachusetts Mohair Plush Co.
Schumacher & Co., F.
Shelton Looms
United States Rubber Co.
Wiese & Co., William

C-6 Radio Compass—Fairchild Aviation Corporation

Big Plane Engineering at Light Plane Cost!

Starter—an exclusive Funk feature:—easily operated, safe, practical and trouble-free. Only $69.50 extra.

New—

All-Metal door with Automobile-type self-locking latch is standard equipment on the Funk Plane for 1940. This equipment provides greater strength and safety, with weathertite fit.

• • •

New—

This new type T-Head control column is standard equipment on the Funk Plane for 1940. . . . It is built with needle bearings to provide fingertip control. . . . This new dual control column assures plenty of leg room. . . . It is same type high grade control column as found in big planes.

ONLY $650 down

--balance easily financed at Lowest Rates!

For performance, economy of operation and downright beauty, the Funk is America's most outstanding inexpensive airplane.

The New Funk "75" for 1940

From every standpoint—construction, performance and appearance—the *new* Funk has "big plane" engineering. . . . The Funk plane and the Funk inverted, liquid-cooled motor were developed to go together, to give what has never been possible before in an inexpensive airplane.

First consider its stability. . . . With power off it is almost impossible to completely stall or spin it. Beginners fly the Funk with ease and safety.

It can take off or set down in high winds. Slow landing speed enables the use of small ports.

Reliability of the Funk liquid-cooled motor increases factor of safety in long distance flights over rough country. . . . Temperature changes have no effect on motor efficiency.

Unobstructed vision in all direction from weathertight cabin assures flying safety in comfort. . . . Beautifully upholstered in leatherette with side-by-side seating arrangement, the cabin gives truly "big Plane" luxury—even to hot water heater.

Here is a real "2-S" airplane at light plane cost!

Operators, Schools, Private Owners: The Funk is the plane that keeps right on operating when strong winds keep light planes in the hangar. . . . Write for full descriptive literature today!

AKRON AIRCRAFT Inc.,
(Akron Airport) AKRON, OHIO, U. S. A.

Fabrics (Wing)
Air Associates, Inc.
Aircraft Steel & Supply Co.
Goodrich Co., B. F.
Suncook Mills
Wellington Sears Co.

Finishes
Aircraft Steel & Supply Co.
American Chemical Paint Co.
Bakelite Corp.
Berry Bros.
Cook Paint & Varnish Co.
du Pont de Nemours & Co., E. I.
Glidden Co.
Goodrich Co., B. F.
Lowe Bros. Co.
Merrimac Chemical Co.
Murphy Varnish Co.
Perry Austen Mfg. Co.
Phoenix Aircraft Products Co.
Pittsburgh Plate Glass Co.
Pratt & Lambert
Randolph Finishing Products Co.
Sherwin-Williams Co.
Spray Engineering Co.
Titanine, Inc.
United States Radium Corp.
Valentine & Co.
Wailes Dove-Hermiston Corp.
Zapon Co.

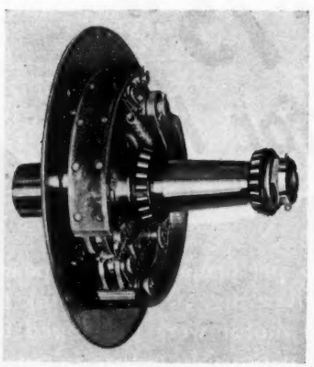
Fuels and Oils
Atlantic Refining Co.
Cities Service Oil Co.
Crusader Oil Co.
Esso Marketers
Ethyl Gasoline Corp.
Fiske Bros. Refining Co.
Fuel Development Corp.
Gulf Oil Corp.
Kendall Refining Co.
Pennzoil Co.
Phillips Petroleum Co.
Pure Oil Co.
Richfield Oil Corp.
Shell Oil Co.
Shell Petroleum Corp.
Shell Union Oil Corp.
Sinclair Refining Co.
Socony-Vacuum Oil Co., Aviation Sales Dept.
Stanavo Specification Board
Standard Oil Co. of Calif.
Standard Oil Co. of N. J., Aviation Div.
Standard Oil Co. (Indiana)
Texas Co.
Tidewater Associated Oil Co.
Wolverine-Empire Refining Co.

Glass, etc.
American Window Glass Co.
Libby-Owens-Ford Glass Co.
Pittsburgh Plate Glass Co.
Röhm & Haas Co.

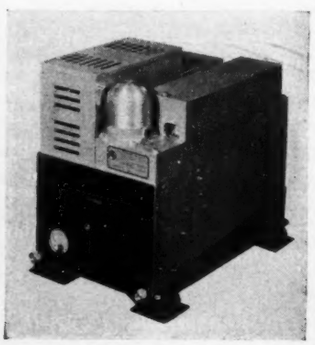
Insulation
American Felt Co.
American Hair & Felt Co.
Bakelite Corp.
Booth Felt Co.
Burgess Battery Co.
Dry-Zero Corp.
Felters Co.
Johns-Manville
Molded Insulation Co.
Seaman Paper Co.

Metals, Bearing
Allegheny Ludlum Steel Corp.
American Non-Gran Bronze Corp.
Bearium Metals Corp.
Bound Brook Oil-Less Bearing Co.
Bunting Brass & Bronze Co.
Chrysler Corp., Amplex Div.
Crucible Steel Co. of Amer.
Federal-Mogul Corp.
Lumen Bearing Co.
Republic Steel Corp.

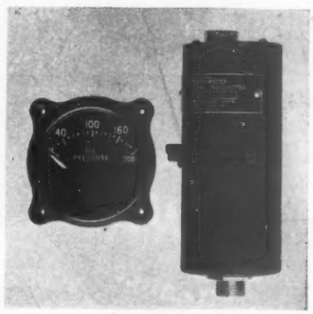
Metals, Structural
Aircraft Steel & Supply Co.
Allegheny Ludlum Steel Corp.
Aluminum Co. of America
Aluminum Industries



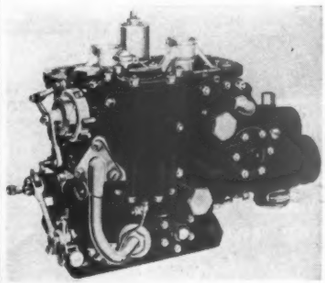
Streamline Wheel and Brake—Bendix Products Div., Bendix Aviation Corp.



Aircraft Transmitter—Collins Radio Co.



Oil Pressure Transmitter and Indicator—Liquidometer Corporation



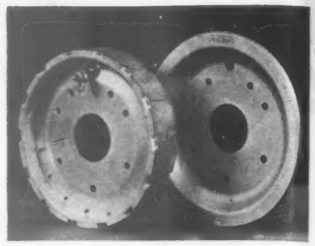
Stromberg Injection Carburetor—Bendix Products Division, Bendix Aviation Corp.

American Brass Co.
American Magnesium Corp.
American Steel & Wire Co.
Ampco Metal, Inc.
Atlas Steel Casting Co.
Baush Machine & Tool Co.
Bethlehem Steel Co.
Carnegie-Illinois Steel Corp.
Carpenter Steel Co.
Chase Brass & Copper Co.
Cleveland Tungsten Mfg. Co.
Climax Molybdenum Co.
Continental Steel Corp.
Crucible Steel Co. of America
Dahlstrom Metallic Door Co.
Dow Chemical Co.
Electro-Metallurgical Co.
Haynes-Stellite Co.
International Nickel Co.
Micro Switch Corp.
Republic Steel Corp.
United States Steel Corp.
Union Drawn Steel Div. Republic Steel Corp.

Rubber, Synthetics, etc.
American Hard Rubber Co.
Bakelite Corp.
Bloxham Aero Mfg. Co.
Continental-Diamond Fibre Co.
Continental Rubber Works
du Pont de Nemours & Co., E. I.
Firestone Tire & Rubber Co.
Formica Insulation Co.
General Electric Co.
Goodrich Co., B. F.
Goodyear Tire & Rubber Co.
Lowe Bros. Co.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan
Röhm & Haas Co.
Spaulding Fibre Co.
Thiokol Corp.
United States Rubber Co.
Weatherhead Co.
Westinghouse Electric & Mfg. Co.

Aviation Spark Plug—M2—LS—Champion Spark Plug Company

Tubing (Flexible)
Aircraft Steel & Supply Co.
American Brass Co.
American Metal Hose Div., American Brass Co.
Breeze Corporations, Inc.
Chicago Metal Hose Corp.
du Pont de Nemours & Co., E. I.
Eclipse Aviation Div. Bendix Aviation Corp.



Expander Tube Brake—Hayes Industries Incorporated

Pennsylvania Flexible Metallic Tubing Co.
Titeflex Metal Hose Co.
Seamlex Co.
United Metal Hose Co.

Tubing (Non-Ferrous)
Aluminum Co. of America
American Brass Co.
Chase Brass & Copper Co.
Chicago Metal Hose Corp.
Ducommun Metals & Supply Co.

Tubing (Steel)
Aircraft Steel & Supply Co.
Bethlehem Steel Co.
Carpenter Steel Co.
Dahlstrom Metallic Door Co.
National Tube Co.
Ohio Seamless Tube Co.
Republic Steel Corp.
Service Steel Co.
Summerill Tubing Co.
Timken Roller Bearing Co.

Wood and Plywood
Algoma Plywood & Veneer Co.
Auld Co., D. L.
Balsa Wood Corp.
Formica Insulation Co.
Haskelite Mfg. Corp.
Met-L-Wood Corp.
National Aircraft Materials Corp.
Paxton Lumber Co., Frank
Posey & Co., J. V. G.
United States Plywood Corp.
Yoho & Hooker Lumber Co.

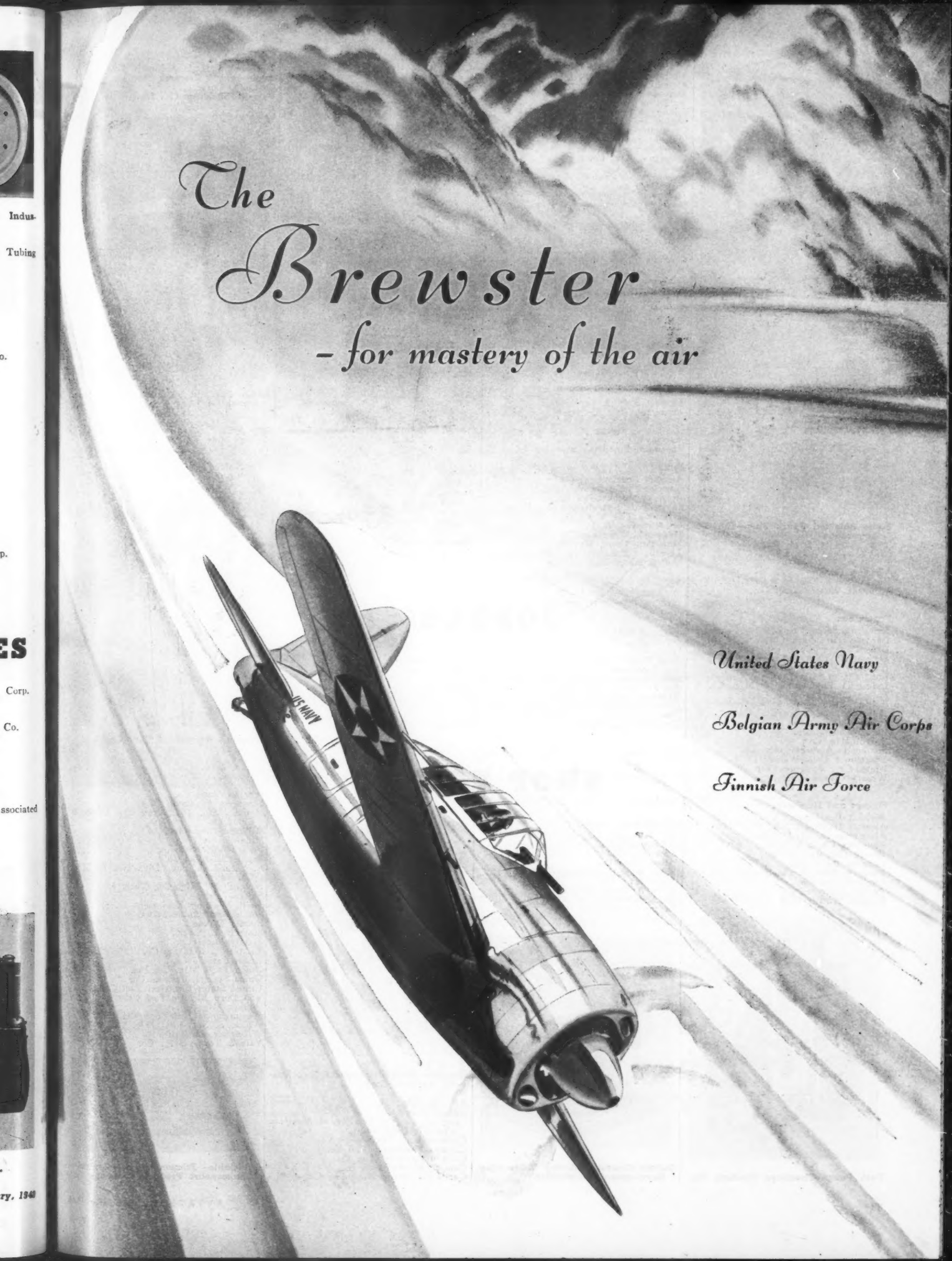
PARTS & ASSEMBLIES

Bearings
Allison Engineering Co., Div. General Motors Corp.
American Non Gran Bronze Corp.
Bantam Bearings Corp.
Bound Brook Oil-Less Bearing Co.
Bunting Brass & Bronze Co.
Chrysler Corp., Amplex Div.
Fafnir Bearing Co.
Marlin-Rockwell Corp.
New Departure Div. General Motors Corp.
Norma-Hoffmann Bearings Corp.
S K F Industries
Timken Roller Bearing Co.

Cables (Structural)
American Chain & Cable Co.
American Steel & Wire Co.
Hazard Wire Rope Div. American Chain & Cable Co.
Macwhyte Co.
Roebling's Sons Co., John A.

Fabricated
Aerial Machine & Tool Corp.
Aero Supply Mfg. Corp.
Aircraft Development Co.
Bendix Products Div., Bendix Aviation Corp.
Bohn Aluminum & Brass Corp.
Boston Gear Works
Breeze Corporations, Inc.
Brewster Aeronautical Corp.
Budd Mfg. Co., Edw. G.
Buhl Stamping Co.
Continental-Diamond Fibre Co.
Cunningham-Hall Aircraft Corp.
Curtiss-Wright Corp., Curtiss Aeroplane Div.
Dayton Mfg. Co.
Doehler Die Casting Co.
Eclipse Aviation Div. Bendix Aviation Corp.
Edo Aircraft Corp.
Ex-Cell-O Aircraft & Tool Corp.
Farrel-Birmingham Co.
Formica Insulation Co.
Fleetwings, Inc.
General Electric Co.
General Tire & Rubber Co.
G & O Mfg. Co.
Grumman Aircraft Engineering Corp.
Hall Aluminum Aircraft Corp.
Hill Aircraft Streamliners Co.
Houde Engineering Corp.
Industrial Engineering & Mfg. Co.
Jadson Motor Products Co.
Kirkham Eng. & Mfg. Corp.
Laminated Shim Co.
Lisle Corp.
Lord Mfg. Co.
Meisel Press Mfg. Co.
Paramount Aircraft Products
Park Drop Forge Co.
Raymond Mfg. Co. Div. Associated Spring Corp.
Simmonds Aerocessories, Inc.
Solar Aircraft Co.
Teicher Aircraft Co.
Thompson Products, Inc.
Union Parts Mfg. Co.
United Aircraft Products
United States Rubber Co.

Fuel Pump—Romec Pump Co.

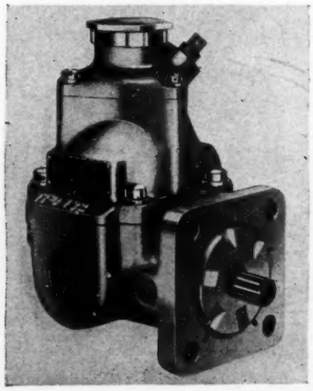

The
Brewster
– for mastery of the air
United States Navy
Belgian Army Air Corps
Finnish Air Force

Radio Shielded Spark Plug—The B-G Corporation

Vimalert Co.
Westinghouse Electric & Mfg. Co.
Wrought Washer Mfg. Co.

Fastenings
American Screw Co.
Dardelet Threadlock Corp.
Dzus Fastener Co.
Elastic Stop Nut Corp.
Hartford Machine Screw Co.
Ideal Clamp Mfg. Co.
Industrial Engineering & Mfg. Co.
Jadson Motor Products Co.
Kellogg Switchboard & Supply
Milford Rivet & Machine Co.
Palnut Co.
Parker-Kalon Corp.
Scovill Mfg. Co.
Simmonds Aerocessories, Inc.
Shakeproof Lock Washer Co.
United-Carr Fastener Corp.
Wrought Washer Mfg. Co.

Fittings and Hardware
Aircraft Development Co.
Aircraft Hardware Mfg. Co.
Aluminum Co. of America
American Chain & Cable Co.
Breeze Corporations, Inc.
Imperial Brass Mfg. Co.
Landers, Frary & Clark
Lunkenheimer Co.
Parker Appliance Co.
Stewart Warner Corp.



Fuel Pump—Thompson Products Co.

Forgings
Aircratt Steel & Supply Co.
Aluminum Co. of Amer.
Atlas Drop Forge Co.
Bethlehem Steel Co.
Billings & Spencer Co.
Canton Drop Forging & Mfg. Co.
Chase Brass & Copper Co.
Endicott Forging & Mfg. Co.
Farrel-Birmingham Co.
Fitzgerald Mfg. Co.
Govro-Nelson Co.
Jadson Motor Products Co.
Park Drop Forge Co.
Thompson Products, Inc.
Union Drawn Steel Div., Republic Steel Corp.
Union Switch & Signal Co.
Williams & Co., J. H.
Wyman-Gordon Co.

Gaskets
Detroit Gasket & Mfg. Co.
Fitzgerald Mfg. Co.
Garlock Packing Co.
Goetze Gasket & Packing Co.
Goodrich Co., B. F.
Johns-Manville
McCord Radiator & Mfg. Co.
Manhattan Rubber Mfg. Div. of Raybestos-Manhattan, Inc.
Permatex Co.
Vellumoid Co.
Victor Mfg. & Gasket Co.

Rods, Tie
Aircraft Steel & Supply Co.
American Chain & Cable Co.
Breeze Corporations, Inc.
Hartshorn, Stewart Co.
Macwhyte Co.
Thompson Products, Inc.

Seats
Aircraft Development Co.
American Tube Bending Co.
Brewster Aeronautical Corp.
du Pont de Nemours & Co., E. I.
Firestone Tire & Rubber Co.
Goodrich Co., B. F.
Heywood, Wakefield Co.
McArthur Corp., Warren
Thompson Products, Inc.
United States Rubber Co.

Spark Plug—Scintilla Magneto Div., Bendix Aviation Corp.

Springs
American Chain & Cable Co.
Barnes, Wallace Div. Associated Spring Corp.
Raymond Mfg. Co. Div. Associated Spring Corp.

Washers, Shock
Lord Mfg. Co.
Thompson Products, Inc.

JOBBERS

Aero Supply Mfg. Co.
Air Associates
Aircraft Steel & Supply Co.
Air Transport Equipment
Bredouw Aeromotive Corp.
Cunningham-Hall Aircraft Corp.
Ducommun Metals & Supply Co.
Dycer Aviation Supplies
Gillies Aviation Corp.
Johnson Airplane Supply Co.
Ort, Karl
Pacific Airmotive
Pacific Scientific Instrument Co., Aeronautical Div.
Richland Auto Parts Co.
Vimalert Co.

SHOP EQUIP'T

Air Reduction Sales Co.
Air Transport Equipment, Inc.
Albertson & Co.
American Chain & Cable Co., Inc.
Atlas Press Co.
Baker Industrial Truck Co.
Binks Mfg. Co.
Black & Decker Mfg. Co.
Blackhawk Mfg. Co.
Breeze Corporations

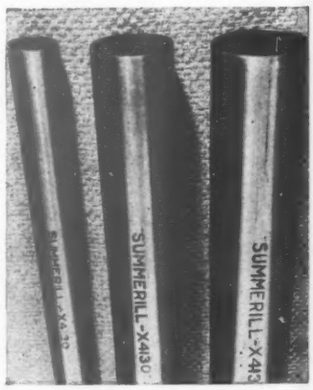
Octane Control Metering Valve—Fuel Development Corporation

Magneto—Scintilla Magneto Div., Bendix Aviation Corp.

Brunner Mfg. Co.
Buffalo Forge Co.
Campbell, Andrew C., Div. of American Chain & Cable Co.
Chambersburg Engineering Co.
Chicago Pneumatic Tool Co.
Chicago Rawhide Mfg. Co.
Continental Machines, Inc.
Curtis Pneumatic Machinery Co.
DeVilbiss Co.
Ducommun Metals & Supply Co.
Engineering & Research Corp.
Ex-Cell-O Corp.
Farrel-Birmingham Co., Inc.

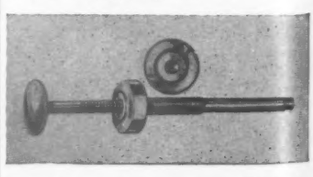
Radio Operator's Chair—Warren McArthur Corporation

Fay & Egan Co., J. A.
Goddell Pratt Co.
Greenfield Tap & Die Corp.
Haskins, R. G.
Heald Machine Co.

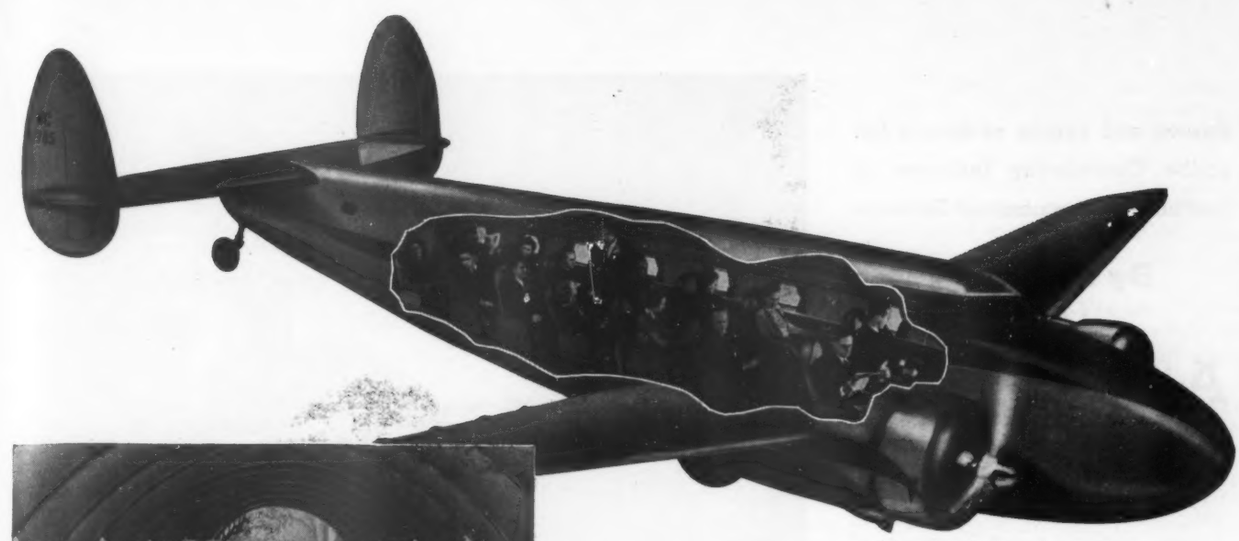


Tubing—Summerill Tubing Co.

Hobart Bros. Co.
Homestead Valve Mfg. Co.
Independent Pneumatic Tool Co.
Ingersoll-Rand Co.
Linde Air Products
Manley Mfg. Div., American Chain & Cable Co.
Millburn Alexander Co.
Millers Falls Co.
Paasche Airbrush Co.
Pacific Scientific Co.
A. Schrader's Son, Div., Scovill Mfg. Co.
Siebenthaler Mfg. Co., Thos. L.
Skilsaw, Inc.
Smith Welding Equipment Corp.
South Bend Lathe Works
Stanley Works
Starrett, L. S. Co.
Streeter-Amet Co.
Templeton, Kenly & Co.
Union Carbide Co.
Union Parts Mfg. Co. Inc.
Union Special Machine Co.
United States Electrical Tool Co.
Van Dorn Electric Tool Co.
Walker Mfg. Co.
Westinghouse Electric & Mfg. Co.
White, S. S. Dental Mfg. Co.
Wilkening Mfg. Co.
Yale & Towne Mfg. Co.



Adjustable Friction Type Control—Shakespeare Products Company



Luxurious comfort characterizes the new 240 M.P.H. Lockheed Lodestar, 14 passenger transport. Illustration above shows view of anodic aluminum seats (Number 157) by Warren McArthur.

Announcement

To All Aircraft Manufacturers

MANUFACTURERS whose busy Engineering Departments and Production staffs are burdened with accessory problems incident to providing proper seating for pilots, radio operators, navigators or passengers may now realize great economy of time, factory space and money.

The Warren McArthur Corporation is qualified by long experience, special engineering studies and exclusive manufacturing methods to design and produce aircraft seating equipment to the specifications of each individual manufacturer.

Extreme light weight and comfort, combined with maximum strength are inherent in all Warren McArthur aircraft seats. Virtually indestructible, the light, powerful frames are of anodic aluminum, untarnishable, and most highly resistant to corrosion.

The method of design and assembly, so impressive to engineers who strive for lasting economy, makes possible the creation of any style; while the anodic process produces an enduring finish, next in hardness to the diamond, yet possessing that velvety feel of satin silver.

WARREN McARTHUR CORPORATION

ONE PARK AVENUE
NEW YORK CITY

LEXINGTON 2-1555

Bassett and Lyman of Sperry Describe Cathode-ray Indicator to Institute of Aeronautical Sciences

Dmitri Deesel

FLIGHTRAY
Ready for the Field

By Don Fink
Radio Editor, AVIATION

A DESCRIPTION of a very significant advance in the art of instrumentation in aircraft was read to the Institute of Aeronautical Sciences at the Eighth Annual Meeting, January 25th, by Preston B. Bassett, Chief Engineer, and Joseph Lyman, Senior Project Engineer, of the Sperry Gyroscope Company. The subject of their paper was "The Flightray, a Multiple Instrument Indicator."

Briefly, the Flightray indicator is a cathode-ray tube, an electronic device similar to that used in reproducing television images. The cathode-ray tube is a funnel-shaped glass structure, closed with a glass face at the wide end. This face has coated on its inner surface a layer of artificial willemite (zinc orthosilicate) which is a fluorescent compound capable of glowing when electrons impinge on it. At the other (narrow) end of the tube is an electron gun, that is, an electrode structure capable of forming a beam of electrons which is shot through the tube to the fluorescent screen opposite it. The beam of electrons, falling on the screen, produces a spot of light, green in color and brilliant enough to be seen under any condition of outside illumination. The beam of electrons may be deflected so that the spot of light falls on any portion of the screen.

By combining different values of vertical and horizontal deflection voltage the beam may be aimed at any point of the fluorescent screen.

Because the electron beam has virtually no inertia, it may be moved over the screen at a very rapid rate. If the beam is moved across the screen in a small fraction of a second, the eye viewing the screen appears to see a straight line, rather than a moving spot, due to the persistence of vision.

The Flightray indicator makes use of the cathode-ray tube because of the very great flexibility with which lines and circles may be drawn upon it, and the rapidity with which the indications may be made. Actually, the indications of four instruments are shown on the fluorescent screen at once, with provision for switching to a fifth. The instruments are the gyro compass, the artificial horizon, the blind-landing receiver, and the air speed meter. An alternative connection to the altimeter is available for level flight and is switched into the circuit in place of the blind landing radio receiver. Also, provision has been made for the eventual indication of the automatic radio compass on the same screen.

It is obvious that simply bringing all these indications to the face of one instrument is not a solution to the problem in itself, because the pilot could easily become confused by the multiplicity of readings unless they were coordinated with the motion of the plane and with the psychology of the pilot in controlling the plane's attitude, direction and speed.

The central feature of the indicator is the small black figure of the airplane which represents the ship as the pilot would see it from the tail. The indications on the face of the instrument are considered as stationary, and the outline of the plane is considered to move with respect to the indications.

The indications are as follows: The long horizontal line passing through the wings of the plane is a representation of the center bar of the artificial horizon instrument. As the ship tilts with respect to the horizon (as the attitude changes), this bar remains on the true horizon, whereas the outline of the ship moves above or below, and at an angle to, the bar in exactly the same fashion as in the usual gyro horizon instrument. The indications of the gyro horizon are simply transferred directly to the face of the cathode-ray tube. The short vertical line at the top of the screen is similarly controlled by the gyro compass, and is calibrated by the scale mark-

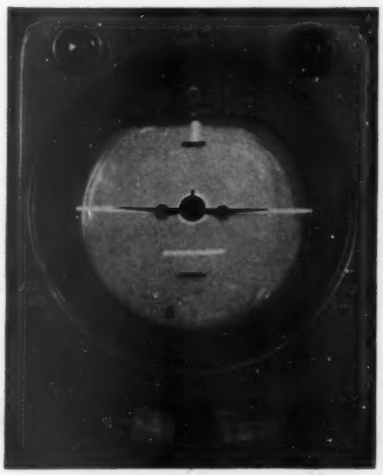
ings directly above it. The short horizontal line below the horizon is controlled by the air-speed meter. Ordinarily the sensitivity of the instrument is set so that the line takes up a position just under the wheels of the figure of the plane, when the landing speed is maintained, whereas the line drops lower for lower speeds, and the short black mark at the bottom is a warning that the stalling speed is being approached. Finally, the circle of light which surrounds the center portion of the figure is controlled by the indication of the blind landing equipment. Any blind landing receiver which gives horizontal and vertical guidance indications can be used to control this circle, and the control is arranged so that the figure of the plane takes up a position, relative to the circle, which is the same as the actual position of the plane relative to the glide path. When used for level flight, the instrument landing receiver is disconnected and the altimeter connected in its place. In that event the figure of the plane takes a position above or below the circle, depending upon whether the plane is flying above or below the reference altitude, which is set on the altimeter itself.

The Flightray indicator thus coordinates and presents to the pilot simultaneously all the indications of four flight instruments, and it does so in such a way that no confusion may arise. In instrument landing, for example, the pilot flys the ship so that the nose is on the circle, keeps the horizon indicator on the nose and horizontal, and sees to it that landing speed is maintained. He need not take his eyes off the instrument once during the descent. When the outer marker of the instrument landing system is passed, the green light in the upper righthand corner flashes, and when the inner marker is passed, the red lamp in the opposite corner flashes.

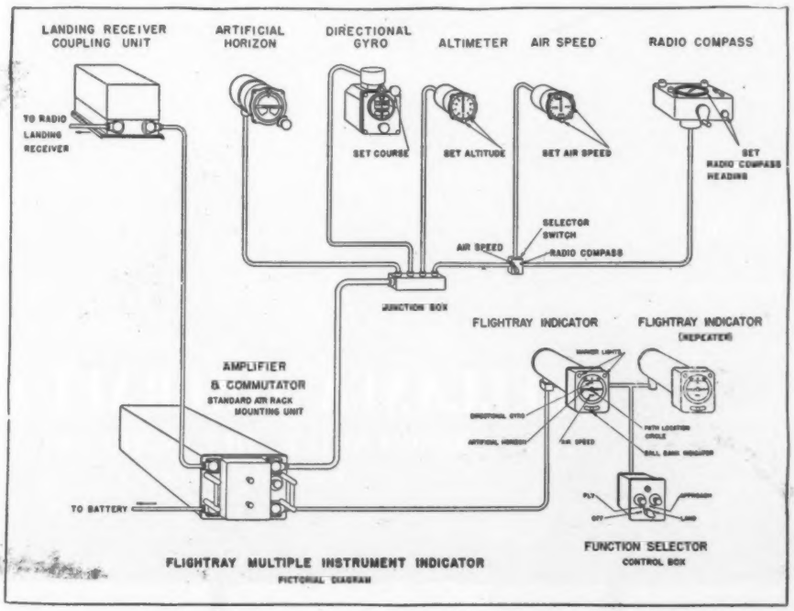
Technical details of the system

The technical arrangements used for bringing the indications of the various instruments to the cathode-ray indicator are shown in outline form in the accompanying diagram. The connection to the instruments themselves is accomplished through Kollsman Telegon instruments, which are small a-c selsyn motors which are capable of indicating the position of a rotating member at a distant point by transmitting a three-phase voltage over wires. The transmitting selsyn system does not employ any rotating winding, that is the selsyn "motor" is a stationary set of windings not dissimilar to those of a three phase synchronous motor. The moving element of the meter whose indications are to be picked up (the gyro compass, gyro horizon, air speed meter or altimeter) is fitted with a very small and light magnetic element which rotates with the instrument. This magnetic element produces a magnetic field in the windings of the Telegon instrument which is fastened directly to the case of the instrument. Wires leading from the transmitting Telegon contain voltages, properly phased to cause another (receiving) Telegon unit, at the opposite end of the circuit, to take up a position corresponding to the position of the rotating element of the original instrument.

The motions of the various Telegon units, one for each instrument, are combined in a commutator unit which converts their rotational motion into voltages required to deflect the cathode-ray beam. Since there is only one beam in the cathode-ray tube, and since it must indicate for four instruments simultaneously, the beam must be controlled successively by the Telegons associated with the instruments, and this successive connection is accomplished by a motor-driven commutator mechanism. In order to avoid any flicker from this successive connections, it is necessary to run through the cycle of the instruments 60 times per second. In other words, the indication of each of the four instruments is applied to the beam sixty times each second, and the indications are interspersed in four groups. Thus 240 separate control voltages are applied to the beam every second, and the beam takes up positions which appear simultaneously before the eye.



The motor driven commutator has, mounted on the same shaft, several armatures, one of which drives the unit from a 12-volt storage battery, others developing the voltages necessary for deflecting the beam, and also the high voltage (2000 volts) necessary to operate the cathode-ray tube. The whole apparatus weighs about 60 pounds, and consumes about 100 watts (in the demonstration, 9 amperes at 11 volts). The Flightray is not offered commercially at present, but a preliminary production will be available for test flights by the airlines and by naval and military services.



FLIGHTRAY MULTIPLE INSTRUMENT INDICATOR
PICTORIAL DIAGRAM

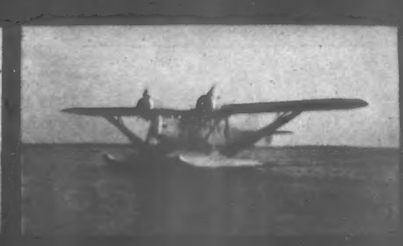
Cruisair Cavalcade

BELLANCA LEADERSHIP

/ IN ENGINEERING ABILITY
/ IN PRODUCTION CAPACITY
/ IN QUALITY OF PRODUCT

Bellanca offers a combination of services to the flying world seldom found in one organization — for over a score of years a consistent producer of outstanding, record-breaking planes, which are also universally known in military, commercial, photographic, ambulance and cargo services. Its engineering ability embraces types from 3-place to 18-place, on wheels, floats and skiis, and from 90 H.P. to 2,000 H.P.

BELLANCA AIRCRAFT COR
NEW CASTLE, DELAWARE, U. S. A.
CABLES: "BELLANCA"



THE AVIATION NEWS

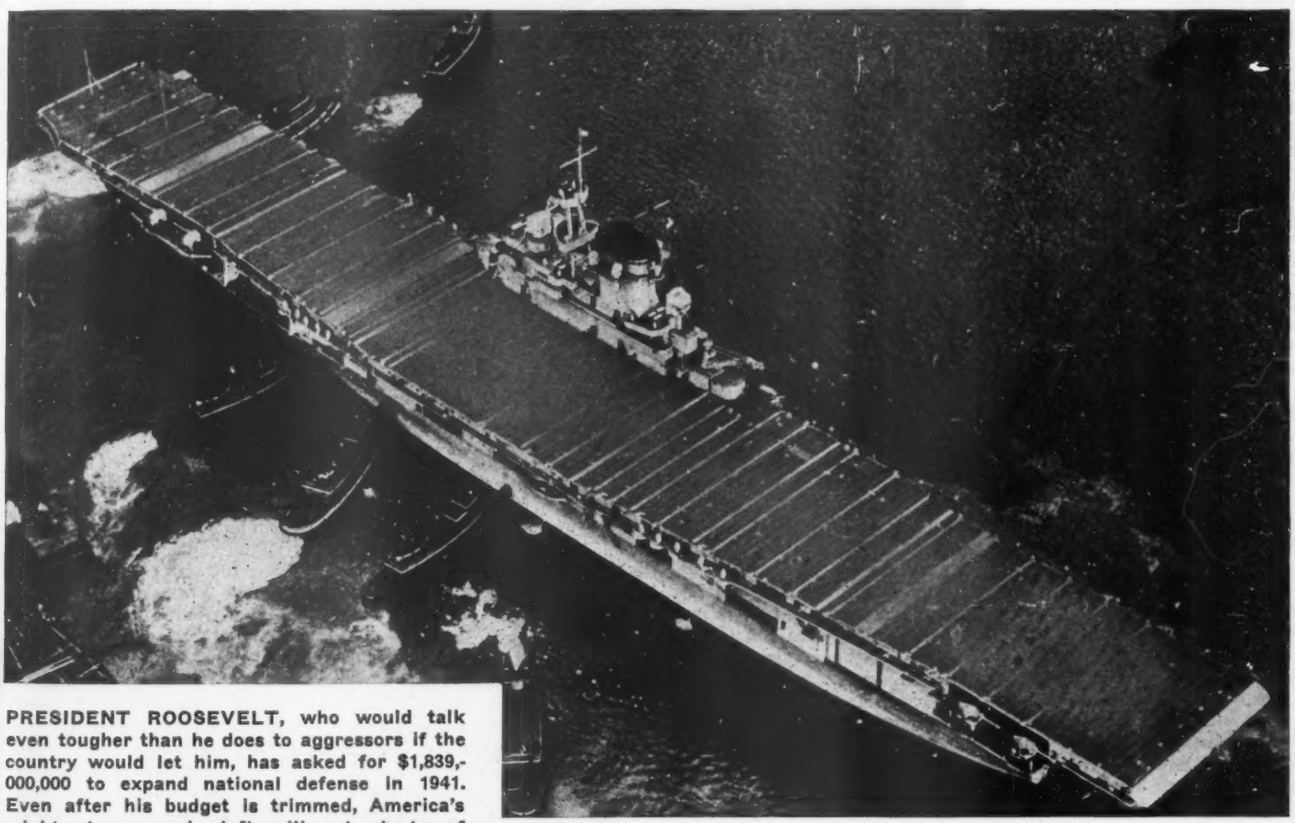
REVIEW, COMMENT, FORECAST

BLAINE STUBBLEFIELD
Washington
C. F. McReynolds, Pacific Coast
Jay P. AuWerter, New York
E. R. Lockin, New York

FEBRUARY 1940

Congress Considers More U. S. Air Power

(Story on page 106)



PRESIDENT ROOSEVELT, who would talk even tougher than he does to aggressors if the country would let him, has asked for $1,839,000,000 to expand national defense in 1941. Even after his budget is trimmed, America's might at sea and aloft will get plenty of money to go on increasing. Here is a pilot's eye view of the new $21,000,000 airplane carrier "Wasp" being nosed away from the United States Steel Company's shipyard pier at Fore River, Mass., for a trial run. Tarpaulins cover parts of the deck to shield secret equipment. Navy expects to receive the Wasp some time next April, about one year after date of launching. RIGHT—A look at the Flying Fortress final assembly line in the Boeing Aircraft Company's Plant No. 2 at Georgetown, Seattle. You see four of the world's mightiest war planes in various stages of completion. The wings were built up, complete except motors, in another department, and brought to this assembly room. Production is at the rate of one ship every four working days. These bombers are built for long range because this country has great distances to contend with.

NATIONAL AVIATION

Authority Considers Proposed Air Routes

Important additions to the country's air route system will get into operation next spring or summer. Hearings have been completed on the applications of Western Air Express and Inland Air Lines for the run from Great Falls, Mont., to Lethbridge. Of course United Air Lines will inherit this prospect if the WAE-UAL proposed merger is approved.

Northwest Air Lines has applied for Chicago-Detroit-Toronto-New York. Opinion is that NAL really wants to go direct eastward from the Twin Cities, but that for the present the Company is playing along with Chicago. That windy city is ambitious to see a line to Shediac which would connect with the northern transatlantic route, thus by-passing New York, which gets too much of Europe's business to suit Chicago. American Air Lines is said to be in the Chicago-Atlantic picture, too.

Penn-Central Airlines has filed for Buffalo-Toronto, Canadian Colonial, which is operating Montreal-New York, has filed for Toronto-New York. Trans-Canada also has filed for Toronto-New York, and hearings have been held. Another application by Trans-Canada would give the company Vancouver, B. C.-Seattle, Toronto-Buffalo, and Toronto-Detroit.

On Jan. 2, partly in retaliation against American Air Lines, it is said, for putting non-stop direct runs on the New York-Chicago route, United Air Lines has filed for Cleveland-Boston via Hartford, Conn.

Long ago Pan American Airways applied for a certificate on the Seattle-Ketchikan route, on which company has made exploratory flights. PAA is too busy on the Atlantic just now to do much on the Alaska route. Hearings have been completed on PAA's application for San Francisco and Los Angeles-Hawaii-New Zealand and the examiner's report was expected as this was written.

Trading of rights between the United States and Canada has gone ahead freely as a result of the recent agreement between the State Department and the Dominion government, and also because the British government has taken its oar out.

S. PAUL JOHNSTON has the new title NACA Coordinator of Research. With AVIATION since 1931, and editor since 1936, he has had a wide background of aeronautical experience to prepare him for the important work he is now undertaking. As Coordinator, he will be chief liaison man between NACA and all other governmental and private research organizations. He will be the buffer and the "get it done" man between the Committee and the industry. Shown above, he is taking the oath of office. Left to right: Paul Johnston; Dr. George W. Lewis, Director of Aeronautical Research; and E. H. Chamberlin, NACA Assistant Secretary.

What About The Airports

Although various localities are holding regional meetings to whip up interest in the $125,000,000 McCarran-Vinson airport expansion resolutions, the CAA itself has kept very quiet since Congress opened. In fact, nothing has been heard around Capitol Hill on the subject so far this year.

The pending resolutions provide for consideration directly by the Appropriations Committee on the theory that the CAA Act already contains ample authority for the program without added legislation.

With economy policies gaining favor in Congress, however, it appears likely that considerable opposition may develop. Probably demands will be loud that any action be preceded by thorough consideration of CAA's extensive airport report, submitted at the last session but never studied by the Senate Commerce and House Interstate Commerce Committees, where it has been gathering dust.

CAA'S Report Card

CAA's annual report, its first, doesn't say much of anything new. It just reviews a lot of things you already know. Maybe this is all to the good. It merely means that, for the first time in years, the business of commercial and personal flying hasn't got a big ruckus on its hands; almost everybody in it is free to go ahead and do his job. There are exceptions, of course, like Pan American Airways and American Export, who are in the ring for a KO. But controversy appears to be at a minimum.

It *is* worth noting that CAA's first report covers only a year and five months—its life span so far. It says that half of the capital which had been invested in the industry before CAA had been lost. More than half of the airlines carrying mail showed operating deficits for the year ending June 30, 1938. Domestic carriers are now handling 45% more traffic, 49% more express, and 12.5% more mail than a year ago, and with few exceptions are bookkeeping in black.

Program Going Strong

Pilot training, still CAA's pet project, will have $6,000,000 for 1941 instead of $4,000,000 which it had this year, if Congress approves the budget request. The additional money would be used to train perhaps 50% more pilots than under the present program. CAA has no plans at present except the increase of training. It might spend more money on practice training, to keep in form those previously trained.

On Jan. 15, more than 35,000 hours had been flown by 9,310 students. Twelve hundred of the students had reached the solo stage. Chairman Robert Hinckley says close to 10,000 students will be certificated by end of next June. He said he was gratified by public acceptance of the plan to train 700 non-college students. Several of the towns participating are adding funds or otherwise augmenting the scholarship plans of CAA.

A recent questionnaire showed that of 300 graduate students, 25 were in the Air Corps. The Army is having trouble, not in getting recruits, but in getting enough men who can qualify. CAA grads are a big help in this attrition problem. The air lines are setting their own schools, and are getting much of their personnel from CAA schools.

Two hundred of 210 students who answered a questionnaire had managed to beg, borrow and steal an average of 12 hours time since graduation. CAA flight training fits men for other aviation jobs than piloting. The airlines and the plane manufacturers like to pick them up for mechanic and traffic training.

New Labs Needed

Under the pressure of war airplane speed has increased about 100 miles per hour during the last year, and is likely to increase another 100 in the next two years, to 500 mph. This opinion was expressed by Dr. Vannevar Bush, Chairman of the National Advisory Committee, testifying before a House Appropriations sub-committee on research appropriations. Dr. Bush said that this country needs additional aerodynamics laboratories to keep abreast of countries making rapid progress under the spur of military necessity.

Seaplane training units have been established in four of the 435 colleges participating in the program. These units are made up of ten students each who are receiving special instruction in marine operations and overwater flying.

Fuel On Strategic List

Aviation gasoline is included in surveys of strategic and critical materials by the Bureau of Mines which will report monthly on production, stocks on hand.

First report by the Bureau showed total production of 859,000 barrels in October, 1939, representing 1.6 per cent of all motor fuel and including output from various methods.

Stocks on hand amounted to 2,400,000 barrels, although part of these had already been sold and awaited shipment. Exports totaled 287,000 barrels for the month. Although domestic consumption has increased rapidly beyond the 1938 average of 200,000 barrels monthly, the Bureau estimates a substantial stock accumulation.

Producers reported maximum aviation gas capacity at 1,500,000 barrels per month. Average octane rating was 84—"lower than expected."

Meanwhile the State Department is extending the moral embargo against the sale to countries bombing civilians of technical information and facilities for manufacturing aviation gasoline.

In The Air

Don't be surprised, the next time you ride an Italian airline, to find yourself floating through the air with the greatest of ease. Air force there is experimenting with seats, controlled by the pilot, which will release passengers and thus overcome any disinclination to take to the silk in emergencies. If tests are successful, device may be applied to all airlines in Italy. . . . And speaking of parachutes, Army doesn't like the fact that gunners, photographers, and others who move around too much to wear seat parachutes, now have to wear attachable types. With a view to substituting back types, different models are now being evaluated at Wright Field; Col. Carl Connell in charge. . . .

Glider flying for boys 16 to 21 is the basis of a flight-stimulation program being pushed by Licensed Airmen of America. Groups of boys are encouraged to get together, as "Junior Airmen of America," and build their own gliders and sailplanes. . . . Perennial lighter-than-aircraft legislation is up again. This time Representative Jones of Texas would have CAA either build and operate two commercial airships for $15,000,000, or form a semi-public corporation to do the same thing. . . .

Don't Try Foolish Flying

WASHINGTON — Bad judgment, lack of technique, acrobatics and "show-off" flying, are again blamed by CAA for the majority of non-airline accidents.

Latest figures of the Air Safety Board show 195 such accidents, but no airline accident other than of a very minor nature. Two accidents brought forth recommendations as to equipment:

That the type of "booster" magneto used be improved by grounding through the ignition switch as a safety measure; that complete electrical bonding be made on all aircraft used in crop dusting operations; that alterations be made to provide scavenging by forced draft of fresh air in all closed compartments; and that the dust discharge pipe be extended into the air stream.

In December, 203 accidents involving 215 aircraft caused 75 fatalities, 20 serious injuries.

Investigation of the Pan-

Harris & Ewing

MOST IMPORTANT CAPITOL AIR SHOW in years was staged at Bolling Field by the Materiel Division of the Army Air Corps in late January. Army ships of all kinds were flown in from fields and factories, giving official Washington its first chance to see newest, as well as all basic types. Here, left to right, are Col. Edmund W. Hill, Commanding Officer of Bolling Field; Secretary of the Treasury Henry Morganthau, Jr.; and General George H. Brett, Chief of the Materiel Division, Army Air Corps, examining a P & W Twin Wasp Jr. engine.

THE WASHINGTON WINDSOCK

by BLAINE STUBBLEFIELD

Designing Post-war Civil Planes

Lesson No. 1 from Europe has landed at Air Corps headquarters. Bombers in recent years have been speeded up and made so maneuverable that, given defensive guns, it was thought they could go un-convoyed on destructive missions. But not so. Report is that one reason for Germany's delay in aerial attack is time out to build more fighters to protect bombers. The problem is different in this country, but watch to see if any similar change of policy occurs.

Dutch airlines is courting the State Department and CAA for rights to enter the U. S., apparently making slow progress. This country is holding back, will drive hard bargains in Europe. We learned our lesson when foreign flag steamship operators got the bulk of transatlantic traffic, most of which is American money. Foreign airlines to the U. S. could run on subsidy and bleed our own lines white, just as shipping did.

Shortage of supermen confronts the Air Corps' training program. Age group 20 to 27 eliminates 80,000,000 of U. S. citizens. Half of the remainder are gals. Many of the rest haven't got the required education. Fully half can't pass the physical. The Army doesn't want to take those who are in school. Many who have graduated have jobs, and will keep them, thank you. Army flying is not as safe as a Morris chair, and war threatens, which is downright dangerous, so Pa and Ma tell Elmer to stay home. By such attritions the potential Air Corps cadet crowd thins down to 100,000. That's why it takes a few ads and sound trucks to smoke them out.

Labor shortage and unemployment go hand in hand, depending on whom you listen to. Aircraft manufacturers, with big rush orders, find no skilled workers on their doorstep, say there's a shortage. Mechanics unions, with thousands of idle on their lists, say bulloney. The answer seems to be that there *is* a scarcity of high skills, but plenty of plain machinists who cannot move their families to where the jobs are. What to do about it nobody knows.

When the war ends this country's airplanes should be standard equipment all over the world, well serviced and supervised. (That's the way we sold automobiles). Thus entrenched we can take the shock of shutdown on military equipment; other countries will be far behind us. In two years, clear of competition, we should make five years progress. Smart manufacturers are not saving their profits for Uncle Sam to sponge; they're plowing them back into engineering on those postwar civil models.

Flight surgeon is a nasty word and should be discontinued, you hear in committee rooms. It started in 1918 war training fields, when the meat wagon and saw-bones were kept handy for cadets who failed to walk away from their landings. Later, it stuck to flight physical examiners. Good place to begin suppression would be in CAA.

Short haul lines are thinking about cutting out seat reservations and letting all comers aboard. Phone and back-checking costs eat up too much of the profit on small revenues. Such a move would create an equipment problem, but rail, bus and boat have had to manage some how. Air transport will have to do it soon or late.

American crack-up at Rio de Janeiro last August brought the conclusion that it was due to "loss of power from the left engine during the landing approach, necessitating an attempted landing under extremely hazardous conditions."

NAA Convention

By Charles F. McReynolds

Sweeping through the most momentous convention in the history of the National Aeronautics Association, delegates to the 1940 NAA meeting in New Orleans (Jan. 10–12) plunked for the new "streamlined" Casey Jones plan of organization and elected a new slate of officers to put the plan in action.

With more than 300 delegates in attendance at one of the most rip-snorting, fun-loving conventions in years, Charles F. Horner announced his retirement from active NAA work after five years as president. Gill Robb Wilson, former war flier and now New Jersey State Director of Aeronautics, was entrusted to carry on and expand NAA activity. Brig. Gen. Walter G. Kilner was named vice president. Secretary William Enyart was reelected, William Redding of Denver chosen treasurer, and Franklin K. Lane, Jr. named counsel. New executive committee: Al Near, Casey Jones, and John H. Jouett. Continuing on this committee are James Webb, Franklin K. Lane, Jr., Wm. Enyart, Wm. Redding and Arthur Dudley.

The convention resolved to: felicitate Charles Horner on his five years of tireless effort, ask for better weather reporting, urge $125,000,000 during 1940 for Federal extension of airports, urge extension of air mail and feeder lines, urge a larger air force for national defense, commend the Aviation Writers Association for fine work, urge standing aviation committees in Congress, ask extension of NACA research—especially for a low-cost, safe airplane, approve and extend the Civilian Pilot Training Program, approve and extend the Army pilot training through civil schools, approve the work of the Aerial Nurse Corps of America, urge cooperation between North and South America, urge a uniform program of state aviation taxes and of state commissions.

Resulting from the work of the Casey Jones committee on reorganization, a complete new set of by-laws was adopted by the convention, as well as the proposed new form of organization. Under the new plan, the NAA becomes an association of associations and seeks to have all American aeronautic bodies affiliate with it in some way.

For generating live interest among the delegates, Al Bennett and Thomas H. Beck stole the show. Bennett is gaining increasing support for his plan, by which any student or private pilot may receive a government subsidy up to $100 per year upon proof of 20 hours of flying per year. This plan has the advantages of simplicity, low cost and absolute fairness to all pilots and operators.

The Beck plan, ably presented by the hard-hitting publishing director of Collier's, proposes that the NAA be maintained as a single national organization with reduced dues, simplified administrative structure, sufficient budget to carry on organization activities and a strong program of objectives. In the future the NAA may return to the Beck plan in event the present reorganization program proves to be a dis-organization program.

DEFENSE

Where The Money Goes

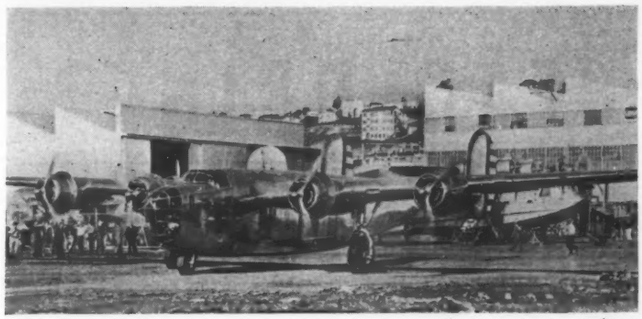
Opposition to the President's $1,839,000,000 national defense program is reaching proportions where it appears administration leaders may have serious difficulty shoving the record-breaking appropriation through Congress. While approval of major items is expected, House action in cutting almost $100,000,000 from the first two bills presented—defense deficiency and independent offics—indicates the economy trend.

Objections apparently spring more from fear of taxation than from an honest interest in economy. Congressmen are balking at the suggestion that they return to their constituents with a new $460,000,000 national defense emergency tax. Next summer's political campaign makes this a touchy subject.

Fortunately, appropriations items referring to aircraft appear more popular than, for example, those relating to the surface fleet. When the House sliced seven millions from the supplemental defense bill, it allowed $28,596,000 for 518 additional Navy planes. Other items in the $264,611,252 bill cover chiefly costs of upkeep for the increased personnel of the Army, the Navy and the Federal Bureau of Investigation. (The FBI, incidentally, is intensifying its sabotage watch, including closer observation of aircraft plants with government orders).

The most active piece of new national defense legislation is the $1,300,000,000 Vinson Naval expansion bill proposing a 25 per cent increase in the surface fleet, doubling of air strength to "not more than 6,000," and additional lighter-

AT THE NAA NEW ORLEANS CONVENTION, center, Gill Robb Wilson, elected president. Above, L to R—Maj. John C. Bennett; Wm. Strohmeir; Al Bennett; J. B. Hartranft, Jr.; T. H. Beck; lower L—W. T. Piper; lower R—Col. J. H. Jouett; C. S. "Casey" Jones; Roscoe Turner.



Acme

THIS FOUR-MOTORED THREE-WHEEL CONSOLIDATED BOMBER is capable of 400 miles per hour, loaded. Here you see it at San Diego, California, rolling along after a test flight, which was watched by high Army officials.

than-air craft. At extended hearings principal discussion has been centering on the vessel provisions with heated arguments as to appropriate size of fighting ships.

Approval of the procurement sections are likely to arouse the greatest controversy before the bill is disposed of. These provisions would allow the procurement by the Navy of both aircraft and vessels, parts and equipment, by negotiation when in the interests of the national defense and where costs are "reasonable." A similar bill relating to Army aircraft was quickly denied by the military committee last year, Congressmen generally opposing further interference with customary competitive bidding principles.

One of the most important steps yet taken in perfecting national defense technique is the move now under way creating an air defense command, confined for the present to the northeastern area. Under Brigadier-General James E. Chaney, the Army is experimenting with the European system of coordinating control of the three air-raid defense services: pursuit airplanes, anti-aircraft units, and aircraft warning services of the signal communications.

Other recent developments include constitution of several new Air Corps units, activation of others. Equipped with new aircraft, bombardment and pursuit groups are destined for Puerto Rico, a pursuit group for Alaska, and a number of organizations for the continental United States.

Air Corps units are also being attached to temporary duty with the newly concentrated triangular Divisions to give observation squadrons training practice with ground forces. Incidentally, first of the Beechcraft F-2 photographic planes under the $528,749 April contract has reached Wright Field.

Meanwhile the military pilot training program is lagging badly, with 400 vacancies in each of the next three classes, despite a variety of publicity efforts to entice applicants.

Bids open April 22 for rotary wing aircraft for an Army experiment on the military effectiveness of autogiro type planes. The War Department says "this experimentation should further its development for additional civil purposes."

On The NACA

You never hear about most of NACA's achievements, but in general its program is no secret. It has four main projects right now. First is its new laboratory at Moffett Field, California. A bill asking $8,000,000 for NACA in 1941 had been approved by House Appropriations as this was written. Of that sum, $4,200,000 would go toward completion of Moffett Field, now under construction. Another appropriation will be asked to complete it in 1942, at a total cost of $10,000,000.

Second, the Committee is greatly expanding its entire research program; it asks $2,775,000 for general expenses, and $1,000,000 for construction at Langley Field.

Third, the country's aero-research facilities having been invoiced by Lindbergh, the Committee is now going to coordinate them in team work. These facilities are mostly in colleges and universities and in industrial plants. This is the job which S. Paul Johnston is undertaking. Incidentally, the Committee is asking Congress for $120,000 instead of last year's $25,000 for contracting research jobs to outside laboratories.

Fourth, the Committee has found that great need exists for aircraft engine research, and is working on a report which will be completed this spring. Undoubtedly Congress will be asked for an additional appropriation to begin work on the engine lab. It is understood that NACA wants to build still more laboratories in the future.

Giros For The Army—?

Predictions at December's Rotary Wing Aircraft meeting of an active year for the flying windmills are already finding confirmation. Army Air Corps, which has been experimenting with its fleet of six autogiros, last month announced a design competition and bid call on rotary wing ships. Although the announcement didn't say so, helicopters will be considered as well as autogiros if they can compete on equal terms. Both ideas on paper and machines in the air will be accepted in the competition, if submitted by engineers or manufacturers of demonstrated soundness in the rotary wing field.

On the technical side, the big news is the establishment, at New York University, of the first regular curriculum for rotary wing studies.

The Budget, 1941

Military Departments for Aviation

	Estimate, 1941	Estimate, 1940
Selected Items		
Navy Department		
Bureau of Aeronautics		
Construction of aircraft (Regular Budget)	$67,798,000	$51,898,000
Construction of aircraft (Emergency National Defense Budget	.....	28,596,000
Maintenance and operation (Regular Budget)	34,804,100	24,900,000
Maintenance and operation (Emergency Nat'l Defense Budget)	9,608,700	5,789,200
Experiments and developments (Regular Budget)	7,500,200	9,500,000
Naval Reserves and Marine Corps Reserves		
Aviation cadets, flight costs (Regular Budget)	3,835,536	3,891,423
Aviation cadets, flight costs (Emergency Nat'l Defense Budget)	3,254,086	1,882,900
War Department		
Air Corps (Regular Budget)		
Procurement of standard airplanes, complete.	40,604,594	149,305,750
Procurement of new models of equipment for airplanes in service	4,000,000	3,796,238
Procurement of spare engines for new aircraft	4,762,267	17,935,200
For experimental development, with equipment procured from the industry and experimental research projects carried on at Wright Field	8,012,842	7,845,342
Service test equipment	4,925,000	400,000
Procurement of material and labor for maintenance of aircraft.	35,205,658	23,872,673
Procurement of fuel and oil for operation of aircraft	12,938,348	7,048,700
Tuition of flying cadets and enlisted mechanics at civilian schools	1,284,000	4,308,800
National Guard		
New airplanes (Emergency National Defense Budget)	3,348,273	.....
Treasury Department		
Coast Guard		
Additional airplanes	2,199,000	.....

Civil Departments for Aviation Purposes

Post Office Department		
Domestic Air Mail Service	$19,380,350	$18,643,200
Foreign air mail transportation	15,674,149	12,519,520
Total	35,054,499	31,162,720
Civil Aeronautics Authority		
General administration	$1,680,121	$1,510,983
Economic regulation	519,222	469,222
Maintenance and operation of air navigation facilities	12,000,000	9,510,487
Technical development	557,000	557,000
Safety regulation	2,420,000	1,990,308
Establishment of air navigation facilities	5,265,280	7,000,000
Civilian pilot training	6,000,000	4,000,000
Air safety board	380,000	380,000
Printing and binding	100,000	100,000
Administration expenses (Emergency relief)	.....	250,000
Total	$28,921,623	$25,768,000
National Advisory Committee for Aeronautics		
Research and investigations	2,800,000	1,849,020
Construction, $1,000,000 for Langley, $4,200,000 for Moffett	5,200,000	2,330,980
Total	8,000,000	4,180,000
Weather Bureau		
Commercial airway meteorological service	2,871,600	2,747,000
Grand Total, Civil Departments	$74,847,722	$63,857,720
Selected Items		
Post Office Department		
Domestic air mail service	$19,380,350	$18,643,200
Foreign air mail service	15,674,149	12,519,520
Civil Aeronautics Authority		
Communication service, teletype	1,323,493	1,336,174
Construction of air navigation facilities	4,329,469	5,428,120
Development projects (technical and planning)	557,000	557,000
Flight training civilian pilots	5,000,000	3,237,550
Ground training, civilian pilots	360,000	206,000
National Advisory Committee for Aeronautics		
Research and investigations	2,800,000	1,849,020
Construction (research laboratories)	5,200,000	2,330,980
Weather Bureau		
Commercial airway meteorological service	2,871,600	2,747,000

AVIATION MANUFACTURING

Big Ships Booming

If another example is needed that it never rains but it pours, note that the same year that brought a flood of war orders saw a 40% increase in passenger miles flown by domestic airlines. One result is increased interest by the airlines in larger craft.

Douglas is now in production on 40 of its new DC-4 four-engine forty-passenger ships. Fifteen of these for the American Airlines order. American, incidentally, is just starting to take delivery on twenty DC-3s. United Airlines is taking ten of the DC-4s and Eastern Airlines is understood to be taking eight.

Vought-Sikorsky division of United Aircraft is starting work on three four-engined flying boats for American Export Airlines. Continuation of their construction past initial work covered in the $2,000,000 contract depends on whether American Export is granted a CAA certificate for its proposed trans-Atlantic service.

Curtiss-Wright is now making flight tests on a 36-passenger substratosphere airliner. This is a twin-engine job with a speed of about 200 m.p.h. at 20,000 ft. Lockheed, also, is developing a big four-engine transport.

Pan American Airways has submitted to Consolidated, Boeing, Curtiss-Wright, Douglas, Lockheed Martin, North American Aviation and Vought-Sikorsky outline specifications for a TransAtlantic super-airliner. The outline calls for an aircraft capable of transporting a payload of 17,500 lbs. non-stop at altitude cruising speeds of better than 300 miles per hour.

Backlog Keeps Growing

Definite entry of the British into the military aircraft market is the big news. England wants at least 10,000 planes over the next 18 months, American manufacturers have been informed. Big purchases previously have been French, but British are nearly set to close orders totaling about $50,000,000 for more than 500 ships—bulk going to Douglas.

That is next year's news, however, since buyers now have little chance of delivery before 1941. The industry enters the year with an airplane backlog of better than $630,000,000 and another $50,000,000 in accessories and supplies. Since estimates of delivery rate by year-end run $50–60,000,000 a month, the manufacturers are books up at least a year ahead.

Of the $680,000,000 backlog, Wall Street Journal credits $247,000,000 to domestic military orders (of which Navy is responsible for $61,000,000), $400,000,000 to export, and $30,000,000 to domestic commercial orders, with private planes contributing $3,000,000.

Manufacturers are still—and will probably continue to be—pretty secretive about exact figures on military orders. Some intelligent guessing is being done, however. Life Magazine reports outstanding orders, prewar and current, for 2,010 combat planes, of which 630 are British and 1,380 French; more than a quarter of these are included in a French order for 590 Curtiss fighters. Life also lists orders, mostly British, for 885 North American trainers.

VULTEE EXPANSION is moving toward more-than-double present plant expansion at Downey, Calif. Floor space will square up to 300,000 feet, and $20,000 worth of new equipment is being installed.

Allied Purchasing Board

Allied purchase of war supplies here, about 30% of which is aircraft, comes under control of the Anglo-French Purchasing Board. Arthur B. Purvis is chairman. A Washington office is opened under Miller Hyde, in the Hibbs Building. Meanwhile FDR has appointed Sec. of Treasury Morgenthau to head a commitee which will see that all U. S. needs are provided for before any aircraft and other goods are shipped abroad. Purchases direct from factories.

Expansion Continues

Curtiss Propellor at it Again. With expansion of its facilities becoming practically a habit (Aviation, January, p. 72), the Curtiss Propellor Division of Curtiss-Wright last month rented an additional 25,000 square feet of floor space in a factory building at Clifton, N. J. The new space will be devoted to experimental and manufacturing work. Space acquisitions of the division in the last three months total 200,000 sq. ft.

More Aeroncas. Its Cincinnati plant too small and subject to flooding, Aeronautical Corp. of America is now building a larger plant at Middletown. Included are a 37,500-sq. ft. factory, office, engineering building, and several others. Production starts in March.

Howard Doubles. Howard Aircraft Corp. of Chicago, during the past six months, has doubled its plant space and quadrupled its personnel.

Auto to Aircraft. In connection with its current reorganization, Hayes Body Corp. is expanding beyond the auto field and will manufacture aircraft, parts, and accessories.

And Even Gliders. Probably war orders have nothing to do with the fact that Schweizer Aircraft Corp. (formerly Schweizer Metal Aircraft Co.) recently moved into an enlarged plant at Elmira and is getting into production on a utility glider and a two-place sailplane.

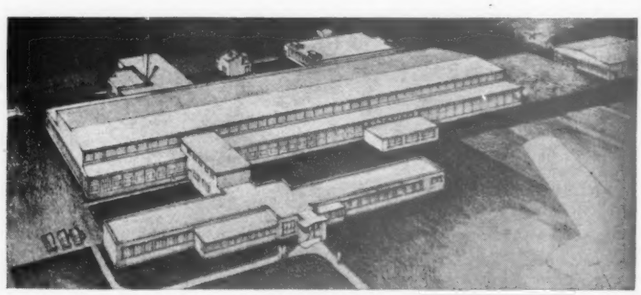
Martin's New Airport

America's biggest aircraft factory landing field, the Glenn L. Martin airport, which cost $1,000,000, went into service last fortnight. It is designed for testing and for fly-away delivery. Of its four runways, the East-West, which is 4000 feet long and paved 2000, is now in service.

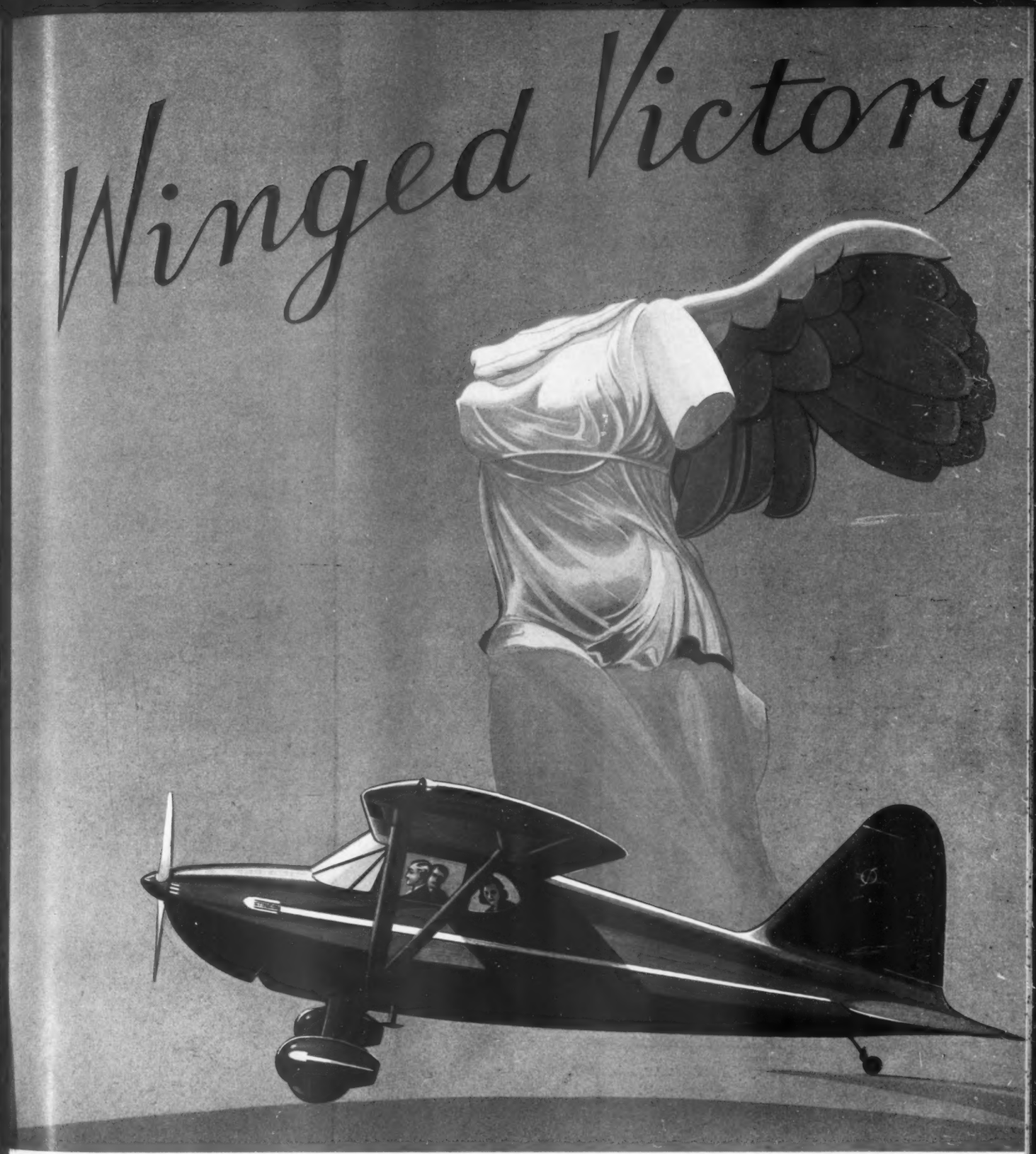
Grumman Celebrates 10th

Grumman Aircraft Engineering Corporation is celebrating its tenth anniversary this year. It is a fitting time for a celebration as the company built a new plant last year at Beth Page, Long Island and production is humming along on a substantial back-log of orders.

Grumman's initial orders in 1930 were for amphibian float gear for the Navy. During lean times the versatile engineers designed a successful light-weight auto truck body but such work



NEW FACTORY and offices of the Aeronautical Corporation of America at Middletown, Ohio. Company is moving from its old location at Lunken Airport, Cincinnati; will be in operation by next spring. Right—Carl Friedlander, president.



Stinson PRESENTS THE NEW "105" FOR 'FORTY

A TRIUMPH OF PROGRESS

A luxurious setting for the loveliest lady, the brilliant new "105" for 1940 is a triumph in air progress because it makes *finer* personal air transportation available at low cost. • A sensation last year because of its unparalleled safety record, its utility, its elegance and obvious quality, the new "105" has vastly increased performance and many valuable refinements. • It opens new skylanes to untold pleasures for the thousands who obtain the *finer* things, because they demand value as measured by quality and price.

(Turn the page for further details)

THE STINSON AIRCRAFT DIVISION, AVIATION MANUFACTURING CORPORATION, WAYNE, MICHIGAN, U. S. A.

SEE THE STINSON "105" FOR 'FORTY

FLY THE "105" to appreciate flashing new performance. Extra power shortens takeoffs 18%, boosts climb 12%, raises service ceiling 20%, jumps cruising speed to 111 MPH. Yet 21 mile per gallon auto economy is retained. • There is added beauty in gleaming new grilles, new colors, refreshingly new cabin interior, soft Laidlaw upholsteries, satin-smooth lines. Learn the *importance* of slots, flaps, hydraulic brakes and Stinson construction which set an unparalleled safety record last year. • There is roomy cabin comfort for 3; larger, softer seats; new sound proofing which reduces noise an amazing 25%. Your Stinson Dealer will explain the 51 new refinements which make the "105" the *finest* personal plane for low cost transportation.

NEW JEWEL CASE INDIRECTLY LIGHTED PANEL has space for blind flight instruments. Plastic control knobs are grouped and recessed to avoid projecting knobs. Note wide doors, headroom, new switch location.

REAR COMPARTMENT is exceptionally large, contains a removable, deeply padded seat. There is ample room for baggage and golf clubs. Note larger front seats in Laidlaw upholsteries. Pilot's seat adjustable.

EXCELLENT VISION and fine accommodations for 3 persons. See improved cabin ventilators, redesigned windshield, hinged auto-type hood for accessibility.

YVONNE GILLESPIE, one of America's loveliest models, poses before the beautiful new "105". The new "105" sells for only $3295.00* at Wayne, Michigan. Note delightful new nose grilles, new name plate, striping and wide landing gear. Low cost finance plan available. *(Federal Taxes included. State and Local Taxes not included).

Stinson

THE "105", on left, operates with automobile economy, yet has the advanced design features which make the 1940 Stinson "Reliant" famous.

STINSON AIRCRAFT DIVISION — Wayne, Mich.

Send me free copy Stinson Plane News. I am ____ am not ____ interested in buying a plane this year.

Name _____

Address _____

ATTENTION — MODEL BUILDERS —

If you wish a large Stinson "105" model kit with instructions for building actual flying model of this famous plane, fill out and mail this coupon today. You will also receive Stinson Plane News. Enclose only $1.50 with coupon. Mail to Stinson Aircraft Division — Wayne, Michigan.

Name _____

Age _____

Address _____

THE STINSON AIRCRAFT DIVISION

AVIATION MANUFACTURING CORP.

WAYNE, MICHIGAN, U. S. A.

was given up when the Navy ordered its first Grumman fighters, in 1931. Since that time a stady stream of fighters, scouts, scout bombers, utility ships, commercial and military amphibians has rolled out of the Grumman plant. Latest and sleekest of them all is the F4F-3 fighter being produced now for the Navy. It has been a busy and highly successful decade for Grumman.

Shell Oil's Scholarship

That $15,000 offered by the Shell Oil Company for scholarships to participants in the C.A.A. flight training program looks pretty good to the students, according to reactions we are getting from the colleges. It was a generous move on the part of Shell, and the fact that the competition will be under the sponsorship of Major Lester Gardner and the Institute of the Aeronautical Sciences is proof that the entire affair will be handled efficiently.

United Borrows Workers

In a move reminiscent of the unsuccessful attempt last year to recruit aircraft labor from the railroads, United Aircraft has arranged with Underwood Eliott Fisher Co., manufacturers of business machines, to take a number of skilled mechanics from its Hartford plant who were laid off through curtailing of Underwood's operations.

Order Hydraulic Equip.

Aircraft Accessories Corp. has received over $100,000 in new business from aircraft manufacturers for hydraulic equipment, according to President Ted Lynn. Largest single order was received from Lockheed for 200 additional sets of equipment and spare parts for use on the re-ordered Lockheed-Hudson bombers for England. Other unfilled orders are on hand from Boeing, Brewster, Consolidated, Naval Aircraft Factory, Sweden, Vought-Sikorsky and Vultee.

C. N. JOHNS, vice president American Chain & Cable Co., whose products are extensively used in plane manufacture, has been placed in charge of operations.

Recent Outstanding Awards

Navy Department

Kollsman Instrument Co. Inc., Elmhurst, N. Y., $96,-153.75, for aircraft altimeters.

Eclipse Aviation Div., Bendix, N. J., $36,860 for hand operated starters.

United Aircraft Corp., East Hartford, Conn. $24,629.25 for aircraft engines.

Eclipse Aviation Div., Bendix, N. J., $198,852 for hand and electric starters.

War Department

Hayes Industries Inc., Jackson, Mich., $34,450 for wheel and brake assemblies.

Bendix Products Div., South Bend, Ind., $110,200 for wheel and brake assemblies.

United Aircraft Corp., East Hartford, Conn., $400,520 for propeller and control assemblies.

Link Aviation Devices, Inc., Binghamton, N. Y., $303,-668 for Link trainer assemblies.

Wright Aeronautical Corp., Paterson, N. J., $124,566.65 for spare parts.

United Aircraft Corp., East Hartford, Conn., $1,148,-009.20 for propeller assemblies and control assemblies.

Air Associates, Inc., Garden City, N. J., $88,806.59 for airplane mooring kits.

Pratt & Whitney Aircraft Division, East Hartford, Conn., $3,005,600 for aircraft engines.

Goodyear Tire & Rubber Co., Akron, Ohio, $373,126.26 for wheel and brake assemblies.

The Ideal Electric & Mfg. Co., Mansfield, Ohio, $57,602 for primary cubicles for night lighting installations.

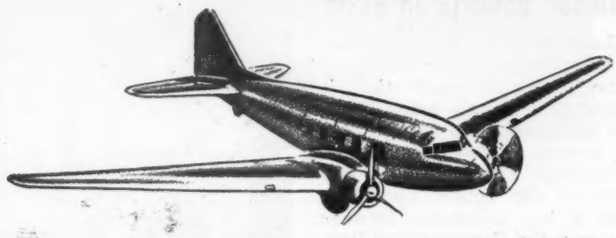
United Aircraft Corp., Hamilton Standard Propellers Div., East Hartford, Conn., $66,597.39 for maintenance parts for propellers.

American Gas Accumulator Co., Elizabeth, N. J., $62,310 for floodlight lamp assembly.

Fairchild Aerial Camera Corp., Jamaica, New York, $519,-349 for aircraft cameras.

Aviation Mfg. Corp., Lycoming Div., Williamsport, Pa., $175,599.60 for engines and spares.

FOR THE MOST EXACTING
AIRCRAFT
SPECIFICATIONS . . .



AMPCO METAL
AND AMPCOLOY BRONZES

More than fifteen aircraft and equipment builders look to Ampco Metal and Ampcoloy aluminum bronzes for the particular characteristics needed in aircraft application—excellent physical property attributes, heat treatable characteristics, light weight (3 to 5% less than steel) and resistance to corrosion, fatigue and wear. Several of these alloys meet Air Corps and Federal Specifications.

Ampco alloys are in constant use for a variety of aircraft applications: propeller bushings, nuts, cones; retractable landing gear adjusting nuts and bushings; valve guides and seats and many others.

Write for data sheets and bulletins giving complete facts—or phone any of the district offices listed below.

AMPCO METAL, INC.
Dept. A-240 Milwaukee, Wis.

District Offices:

Chicago, Illinois Wabash 1211
Burbank, California Charleston 6-2813
Plymouth, Pennsylvania 9-1103
Indianapolis, Indiana Harrison 0869
Cincinnati, Ohio Main 3294
Springfield, Massachusetts 44152
New York, New York Cortland 7-6487
Buffalo, New York Cleveland 0192
St. Louis, Missouri Flanders 4978
Philadelphia, Pennsylvania Evergreen 1131
Pittsburgh, Pennsylvania Atlantic 2458
Cleveland, Ohio Endicott 3632
Boston, Massachusetts Beacon 2912
Washington, D. C. Republic 1546
Detroit, Michigan Tuxedo 21402

"The Metal without an Equal"
AMPCO METAL
. . distinguished by this mark.

AVIATION ABROAD

Bomber Escorts In Style

Last month's increased air activity in the war not only gave plenty of signs that it might toughen up before long, but also brought in enough data to permit a few clinical observations. The North Sea saw most of the action, but there was a big difference between the way the Germans and British went about it.

The Germans, both in their high reconnaissance and bombing flights over the coast and in their low attacks on ships, operated almost entirely in small groups of a few planes. In most cases they took advantage of altitude or weather conditions to avoid fights as much as possible. The British patrols and raids, on the other hand, were mostly carried out by sizeable groups and in a good many cases were continued even against strong defenses. The British claim this is all due to their bombers being so much better armed than the Germans' that they can afford to plough right ahead against opposition. Considering the figures put out by both sides the British certainly have done a lot more damage to defending fighters they've met than the Germans have. However, for the British to announce as glorious victories battles in which they admit losing almost as many nice big bombers as they claim to have brought down fighters, is certainly stretching the truth.

Adding up the experience of both sides, it looks as if attacks delivered on the present scale either bring most of their ships home safely without having accomplished much, or else get some results at an exorbitant cost. There are certainly two ways out of this situation. One would be to increase the number of bombers per raid up to the hundreds talked of before the war, which ought to swamp the defense completely enough to get plenty done with a comparatively small loss. The other would be to keep on with small scale raids, but provide them with enough convoy fighter strength to get through the defending fighters and back again. It's certainly worth noting that this latter method, which before the war was laughed at as oldfashioned and downright cockeyed, is the one that both sides are now talking about the loudest.

Boumey-Eliscofon

NO, THIS IS NOT NORTH BEACH—it's Helsinki Airport, one of the most modern in the world. Before the war, this was the port of call for Polish, Swedish, German, British and Dutch Companies. That's the control panel in the center.

Beside their use for escort duty, a bunch of long range fighters would come in mighty handy to both sides for patrol work and independent raids on enemy air bases. However, so far neither side has shown off anything in the line of a fighter able to go a couple of hundred miles and take on an interceptor on anything like equal terms. The Germans brought out their prize two motored Mell0 fighters to greet the British raids on their North Sea bases, and they seem to have shown up pretty well. However, they weren't designed for particularly long range, and the Germans apparently aren't counting on them for this job. They're busy talking about a new Junkers long range fighter said to be in heavy production, and der Tag is supposed to be set for the date enough of them are in service.

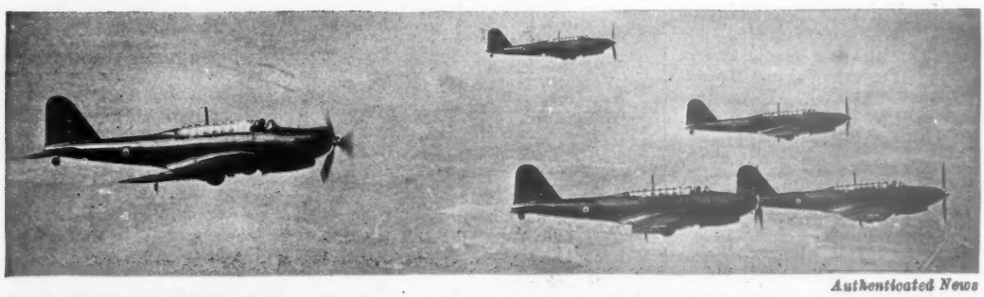
Cannon vs. Machine Guns

The British, in spite of the great things they claim for their turret-infested bombers, also announce that they have plenty of long range fighters coming along, and promise the Germans a nasty surprise when they find out about them. Just what they are the British aren't saying. Some expect them to turn out to be the two motored fighters known to be under way in quantity, but earlier dope about these hush-hush jobs didn't credit them with any remarkably long range. Another possibility is the Boulton Paul Defiant, a two seat fighter about which little has been heard since it was unveiled last spring, except that it's known to be in production. This is a nice looking monoplane about the size of a Hurricane and using the same Rolls Royce Merlin III, but behind the pilot it carries a power operated multigun turret. Just how hot a performance it would have loaded up enough for long range work is a question.

The British still talk about how much better a lot of machine guns are than a shell gun, and they're probably right as far as battles between fighters go. For use against bombers, however, the shell gun may turn out to have the edge. In the biggest raid to date carried out by the British against the German North Sea bases, the Me-llOs that opposed them were able to get in some good work with their shell guns from ranges as great as 1000 yards, and their shells make quite a hole in an airplane. For some negative proof of the shell gun's value, look at the number of both sides' bombers on which fighters registered a bunch of hits with machine guns, but got home right side up.

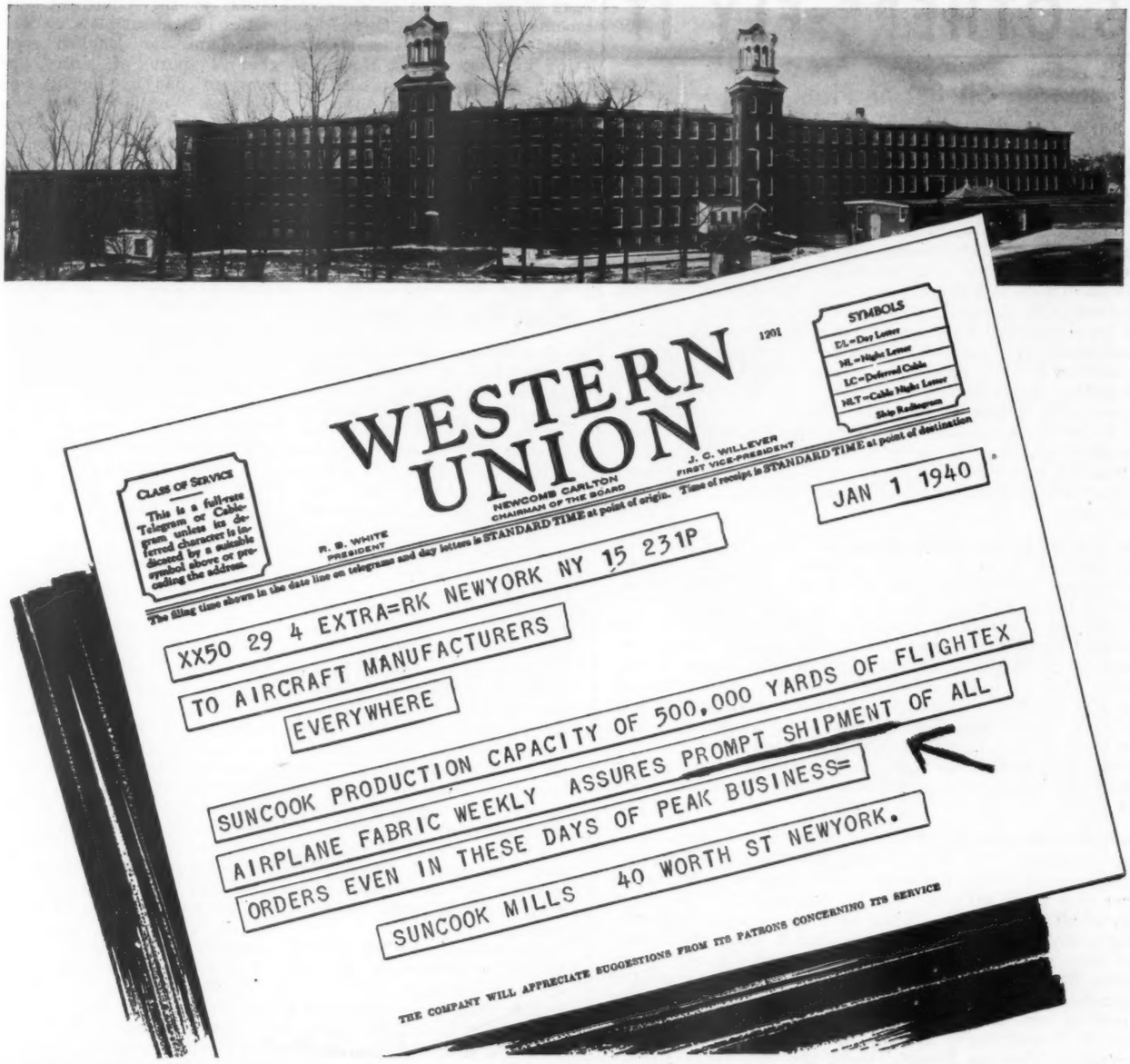
Japs Are Expanding

The Japanese are stepping out at last into the world airline setup with a line scheduled to open in February between Tokyo and Bangkok, which will give their system a tieup to foreign lines for the first time. The announced route goes by way of Taihoku on Formosa and Hanoi, French Indo China. Survey flights have been made with Japanese-built equipment, but the regular service will use Savoia Marchetti SM75s. Five of these ships are supposed to have been received already, with five more coming later in the year. The Japanese, by the way, must have got their DC-4 put back together about the way it was meant to go, as it's reported making trial flights around Tokyo.



Authenticated News

FIVE BRITISH-MADE Fairey Battle monoplane bombers flying over some place in Europe. Belgian Army air pilots are at the controls. The "Battle" is powered with Rolls-Royce Merlin 990 to 1000 h.p. engine. It reaches a maximum speed on the level of 257 miles per hour—414 km.h. Carries a crew of two with a conside-able load of bombs. Notice that ship could land on retracted gear.


WESTERN UNION
1201
SYMBOLS
DL = Day Letter
NL = Night Letter
LC = Deferred Cable
NLT = Cable Night Letter
Blue Radiogram
NEWCOMB CARLTON
CHAIRMAN OF THE BOARD
J. C. WILLEVER
FIRST VICE-PRESIDENT
R. B. WHITE
PRESIDENT
CLASS OF SERVICE
This is a full-rate Telegram or Cable-gram unless its de-ferred character is in-dicated by a suitable symbol above or pre-ceding the address.
The filing time shown in the date line on telegrams and day letters is STANDARD TIME at point of origin. Time of receipt is STANDARD TIME at point of destination
JAN 1 1940
XX50 29 4 EXTRA=RK NEWYORK NY 15 231P
TO AIRCRAFT MANUFACTURERS
EVERYWHERE
SUNCOOK PRODUCTION CAPACITY OF 500,000 YARDS OF FLIGHTEX
AIRPLANE FABRIC WEEKLY ASSURES PROMPT SHIPMENT OF ALL
ORDERS EVEN IN THESE DAYS OF PEAK BUSINESS=
SUNCOOK MILLS 40 WORTH ST NEWYORK.
THE COMPANY WILL APPRECIATE SUGGESTIONS FROM ITS PATRONS CONCERNING ITS SERVICE

FLIGHTEX

WORLD'S PREMIER AIRPLANE FABRIC

SUNCOOK MILLS
LEADING MANUFACTURERS OF FABRIC AND TAPES FOR THE AIRCRAFT INDUSTRY

FLIGHTEX FABRIC

40 WORTH STREET, NEW YORK
Export Representative—Aviation Equipment & Export, Inc., 25 Beaver St., N. Y. Cable Address—"Aviquipo"

RESALE DISTRIBUTORS: AIR TRANSPORT EQUIPMENT, INC., Mineola, N. Y.; INTER CITY AIRLINES, East Boston, Mass.; AVIATION SUPPLY CORP., Hapeville, Ga.; KARL ORT, York, Pa.; SNYDER AIRCRAFT CORP., 6056 South Cicero Ave., Chicago, Ill.; THE AIRCRAFT STEEL & SUPPLY CO., Wichita, Kan.; PACIFIC AIRMOTIVE, Burbank, Cal., and South San Francisco Airport, San Francisco, Cal.

AS OTHERS FLY IT

Sit Out or Pitch

The British cabinet shakeup last month had a double barreled aeronautical tieup. Among those gunning for Mr. Hore-Belisha were a lot of R.A.F. rooters who had two grounds for not being overfond of the way he ran the War Ministry. They regarded him as one of the ringleaders in the move to hand over to army command the R.A.F. units operating with it. This switch has been rumored for some time but now seems to be definitely out of the picture. Even more painful to R.A.F. partisans were the stories that the army was also demanding increased production of specialized types designed for its needs, even if ships suitable for independent air force action had to be shelved for them. In addition to such immediate gripes, there's been a general feeling in and around the R.A.F. since the beginning of the war that it hasn't had a fair chance to show what it can do on its own hook. Since Mr. Hore-Belisha has been considered in favor of trying to sit the war out as much as possible, he's come in for plenty of cussing from those in favor of the R.A.F.'s going in and pitching a few hard ones over.

Also involved in the cabinet doings was Sir John Reith, who was drafted from his civil aviation job and put in the current cabinet hot seat as Minister of Information. His reputation as a trouble shooter got him appointed head of Imperial Airways last year after its spanking by the Cadman Committee, and recently he'd been picked as chairman of British Overseas Airways. The latter is still pretty much of a paper organization, but the merger of Imperial and British Airways has already gone a good way under the auspices of National Air Communications. The new head of B.O.A. will probably be either Clive Pearson, chairman of British Airways, or Walter Runciman, another one of the housecleaners sent into Imperial's management last year.

North Atlantic plans for 1940 are still in the when—as—and—if stage. The British haven't made any official announcements; they probably won't repeat last year's error of putting out dope on what they intend to do before they're all set to do it. They have boats capable of running a mail-only service for now, but it looks as if work has been suspended for the duration on the new landplanes fit for the Atlantic that were underway at the beginning of the war. However, the British confidently expect to see some sort of a line running this summer, even if it isn't on a much larger scale than last summer's. As for the French, there are the usual rumors heard around this season for the last few years that they're planning to buy some big boats in the U. S. to run their line with. This year's story has them dickering for some Vought-Sikorskys. They have gone ahead with the six engined 45 ton CAMS 161 boat ordered for their line and have it in the test flight stage, but work has been dropped on the three superbig boats of around 70 tons that were due out in 1941. They may do something this summer with the four Farman landplanes designed for substratosphere Atlantic mail work.

One transoceanic line that should come through this year is KLM's long-expected one over the South Atlantic. The official word is that survey flights will start this spring over the Amsterdam-Lisbon-Cape Verde Islands-Paramaribo route. A specially equipped DC-3 will be used, carrying mail and express only during the warm-up period. Passenger service with four engined equipment is slated to follow, but the Dutch aren't promising just how soon. They decidedly deny, by the way, that they've already signed on anyone's dotted line for four engined ships. Beside the stories of deals with U. S. manufacturers, there has been plenty of gossip in Europe mostly to the effect that they were pretty well sold on Focke-Wulf Condors. According to KLM, they're still making up their minds.

Beside the expansion outside their own borders, the Japanese are planning a lot of improvements nearer home. One of the chief items on the list is putting in a lot of first class airways in Manchukuo, complete with real airports, lighting, radio communication and navigation aids, and all the rest required. The only catch is that the program they've announced calls for much more money than the government has ever been willing to shell out before for commercial flying.

About The Airlines

For a tough set of conditions under which to run an airline, take a look at the setup the neutral lines running into belligerent countries have to face. Facilities for the cross-Channel services into England, for example, may be a little better than when Mr. Bleriot was making this run, but they certainly aren't much up on those of the immediate post-last-war days when airlines were in what is hopefully called their infancy. All the lovely aids like plenty of weather reports and radio communication and direction finding have been cut down as close to zero as is possible to get by with. To make things cozier for the passengers, all their windows have to be painted over. It's a fine job the boys have been doing keeping things going smoothly and safely, and it's a nice tribute to the trade that passengers have continued to turn out in numbers that have meant full ships and extra sections.

There have been lots of complaints in Britain that the government has not only let the British lines down harder than was required, but also that it's made things unnecessarily tough for the neutral lines, which have certainly been doing the country a big service by furnishing rapid transportation to the Continent. The critics just about blew up when Shoreham, the English cross-channel port of entry, got drowned out by heavy rains and all services were suspended for three days before the government made up its mind to let the lines use another field.

The British lines haven't made much news lately, and the proposed routes mentioned here before are still proposed. Another proposal will probably be added before long; if Britain and Italy continue to make up, there'll certainly be a move to improve air communications between the two countries. The French also haven't done anything startling, but they have got their promised Paris-Lisbon line running to tie up with Pan American. This means quite a bit, as it has given an airmail connection with the transatlantic line through France and England to Holland and the Scandinavian and Baltic countries.

The Russians are expected to get their line into Bulgaria going before long; it will cut out over the Black Sea from Odessa to Varna to dodge Rumania, with whom the Russians are on nose-thumbing terms. They seem to have finally turned a deal with the Germans for the Moscow-Berlin service, which is now scheduled to start early in the year via Minsk, Bialystok, Koenigsberg, and Danzig. The line will run in pool by Lufthansa and Aeroflot. The Germans have also announced, without furnishing any details, that a Berlin-Chungking service will start soon, but our money still says that it will be a long time before anything resembling a real airline is established on that route; the situation is still hanging fire.

International

THE OPERATION WAS A SUCCESS but the patient died. These British lads have just returned from a raid on Heligoland bases, saying they brought down 12 Messerschmidts. But seven English planes failed to return.

ONLY RYAN HAS WON
SERVICE STRIPES
BECAUSE IT'S
Service Perfected
Unlike most airplanes that are flown by expert hands, primary trainers must stand up under the grueling use and abuse of beginners... That kind of stamina is not developed on drawing boards nor proven by professional test pilots... Because there is no substitute for experience, it is well to remember that back of 1940 Ryan metal, low wing primary trainers are six years of perfecting through actual operations.
RYAN AERONAUTICAL COMPANY
Lindbergh Field,
San Diego, Calif.
CONTRACTORS TO THE
Ryan
U. S. ARMY AIR CORPS

AVIATION PEOPLE

SMILING MAN these days is Leroy Grumman, for he is receiving many congratulations as his firm celebrates its tenth anniversary. In brief space of ten years the Grumman organization has grown from a small and almost unknown firm to one that is internationally known.

MOST RECENT HONOR to Major James H. Doolittle was that of being elected President of the Institute of the Aeronautical Sciences. Aviation Director for Shell Oil. Jimmie is not only a top-notch pilot but is a distinguished aeronautical engineer as well.

Wide World

BRIG. GENERAL WALTER G. KILNER, appointed by the President to the vacancy in the National Advisory Committee for Aeronautics caused by resignation of Col. Lindbergh. In Gen. Kilner, N.A.C.A. is getting the assistance of a man with great aeronautical experience.

FIRST TO RECEIVE Chanute Award of Institute of Aeronautical Sciences is famed test pilot Edmund T. Allen, Director of Aerodynamics and Flight Research for Boeing. Award is given annually to pilot making outstanding contribution to aeronautical sciences.

Harris & Ewing

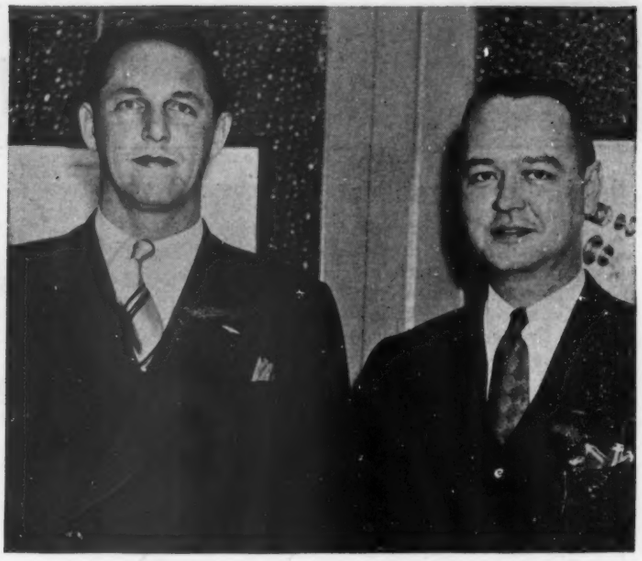
AT THE AIR CORPS' EXHIBITION in two hangars at Bolling Field Washington, Glenn Martin, airplane manufacturer (right) is examining the nose section of one of his medium bombers, with Capt. P. W. Timberlake, of the Air Corps chief's office. At least $10,000,000 worth of Wright Field research equipment and testing was exhibited, much of it shown publicly for the first time. Captain Clarence S. Irvine, in charge of the show, stated there was nothing about aircraft design or manufacturing that was not on display. The entire exhibit was well arranged and well displayed.

PROMINENT AMONG AWARDS made at the Honors Night dinner of the Institute of the Aeronautical Sciences was the presentation to George J. Mead of the Sylvanus Albert Reed Award for 1939. Citation read: "For the design and development of high output aircraft engines."

MOVING FROM ASSISTANT works manager for Lockheed to General Manager of the subsidiary firm, Vega Airplane Co., H. E. Ryker is now in charge of all Vega operations. Ryker has made valuable contributions to improved factory production, procurement and standardization methods.

BUSY MAN THESE DAYS is Bernt Balchen, Norwegian pilot, who is heading up the purchasing in this country of aviation equipment for Finland. Balchen returned here last month after spending considerable time in Helsinki helping to organize air defense. He is as well qualified a man as the Finns could choose for the job. He knows American products and has a first-hand knowledge of the terrific weather conditions which aircraft and engines are subjected to when operating in the far north.

A. H. MARSHALL, now Chief of Sales Engineering at Pratt & Whitney. In his 12 years with Pratt & Whitney he has done experimental test work, built test houses, done planning and testing of engine installations and been head of the installation department. He is well fitted for his new work as his former jobs with P & W took him on extensive trips throughout the country. He has been company representative at most of the nation's large aircraft factories and knows what the buyers want.



TWO WRIGHT AERONAUTICAL MEN moved up the ladder in January. Burnham Adams, right, was promoted from West Coast representative to managership of Wright's new selling division of the Sales and Service department. Paul Youngs, left, sales engineer for the company, was promoted to West Coast representative. Adams joined Wright 15 years ago, the day after he graduated from Yale and has had a variety of engineering and sales experience. After working in the Assembly departmnt he joined the test engineering staff, then organized the field engineering division, later entering the sales department and becoming president of his firm's west coast subsidiary. Youngs has been with Wright several years and previously had 11 years of military and transport flying, the latter with Pan American. After his military service, he joined Pan American in 1932, serving as a pilot on a South American run, and in 1934 acting as chief pilot of a division. He has flown some 5,600 hours.

WEST COAST REPRESENTATIVE for Pratt & Whitney is Hubert A. Gosselin, until recently Wright Field representative for his firm. Beginning as a test engineer, he later was made project engineer on the P & W Hornet series. He has been with his firm for the past six years.

NEW ASSISTANT Sales Manager for Pratt & Whitney is William P. Gwin. With P & W since 1927, he learned engine work in the factory, then moved to service department and later to sales. Before his recent promotion he was six years head of the West Coast office.

PRESIDENT B. D. Adams of the new advertising firm of Burke Dowling Adams, Inc., recently formed in Montclair, N. J., to specialize in aeronautical advertising. Adams has been in aviation for over 12 years, including four years as Assistant Sales Manager of Wright Aeronautical.

AND VICE-PRESIDENT Thomas Dixcy who moves to his new job after four years with Wright's Public Relations Department where he was associate editor of the well-known Trade Winds. Previous to his employment with Wright Aeronautical he was in newspaper work.

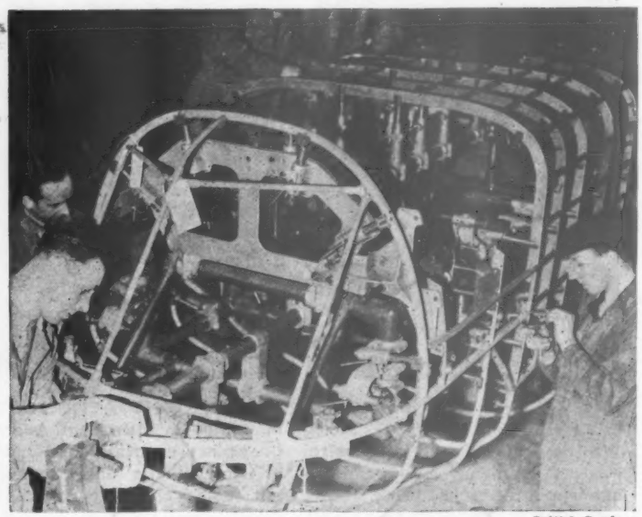
AVIATION ENGINEERING

New Army Photo Ship

The Army Air Corps is now making tests on the largest airplane it has yet purchased for purely photographic uses. The ship is a commercial six-passenger twin-engine job modified to permit the handling of aerial mapping cameras; it will take two of any type of camera the army uses.

The plane is a Beechcraft, type F2, the first to be delivered of a $529,000 contract held by the Beech Aircraft Corp. Weighing 7,000 pounds and powered by two 9-cylinder, 350-hp Pratt & Whitney engines, the ship is an all metal, low wing monoplane with a wing spread of 47½ feet; it carries no armaments.

This is the first air corps ship in which, as it comes from the manufacturer, two T-3A cameras can be mounted in tandem. The T-3A is a five lens aerial camera. In one exposure, this camera covers a large area on five separate negatives.



British Combine

A BRITISH JIG: This looks like a plumber's pipe-dream, but in reality all of that iron pipe work in the center are the clamps for holding the necessary parts to a short-nosed Blenheim Bomber.

Wright's 2000 h.p. Approved

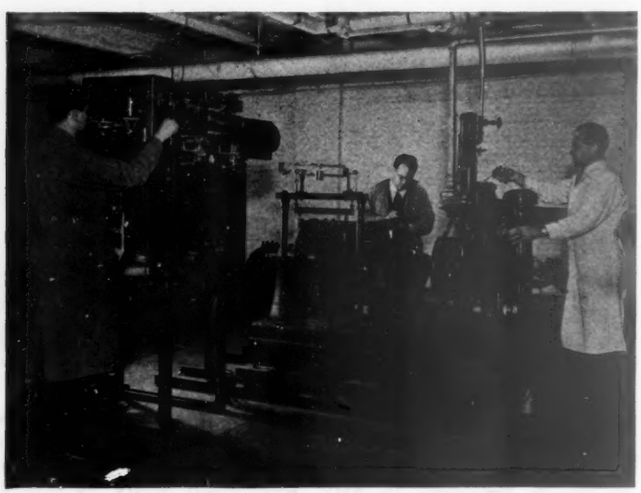
From the C.A.A. comes the announcement that the 2000 hp. engine that has been under extensive laboratory and flight tests recently by the Aircraft Airworthiness Section, has been given a type certificate for manufacture. The engine is an 18-cylinder air cooled engine developing 2000 hp. on takeoff. This engine, built primarily for use in large transport aircraft, is the most powerful engine ever certified for commercial purposes in this country.

Radios For North Beach

Fifteen Western Electric radio receivers, free from interference to a very marked degree, have been installed at La-Guardia Field. The control tower, of course, is the master key to the situation, and to avoid confusion it is a prerequisite to have this type of interference free receiver.

The ears of the dispatchers are spared the sounds of the receivers constantly turned down by a device known as an automatically operated "codan". In the absence of a signal the receiver appears dead, sound coming only when the carrier wave from a plane's transmitter is picked up at the correct frequency.

The air lines are assigned to regular day and night channels, with one receiver constantly being tuned to 4495 KC, the frequency for Army aircraft. The voices of private flyers come in over a daytime frequency of 3105 KC, and a nightime frequency of 6210 KC. The two additional receivers are maintained as emergency spares, with a possibility that additional channels will be allocated to them in the future.



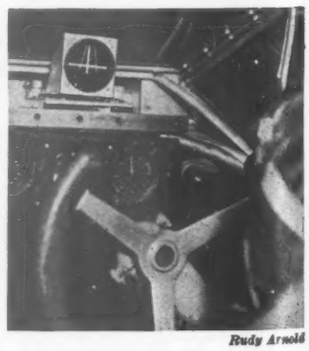
B.G. TEST SET-UP: The B.G. Corporation, New York, uses this arrangement of apparatus for testing aircraft spark plugs. In the centre of everything is the laboratory test engine hooked up to a dynamometer, with the power of the engine being used as a method of determining the best spark plugs.

From The N.A.C.A.

In a way of collecting up some NACA rumors and dumping them into the proverbial hat, here are several that are being transmitted over the grapevine wires. For instance, it is popularly supposed that the N.A.C.A. has a new plane, maybe with no fuselage, which can go 500 m.p.h. and a superlight finned engine which will give all present air cooled motors a run for their money in pounds per horsepower. Here's what appears to be the real dope. The wing is the result of research on a new principle, with the aim of reducing wing drag to perhaps as low as 60 per cent of the best present-day design. Research on the engine still seems to be shaded in secrecy, but a new cooling system on a single cylinder with the aim at cheaper cylinders, with souped up cooling, seems to be part of the story. At the present, however, neither a whole new plane nor a whole new engine exists, but it looks as though we should get ourselves ready for a couple of radical designs.

Navy's Landing System

Through the use of indicator needles on a dial at the top of the instrument panel, the Navy pilots at the Naval Air Station, Lakehurst, N. J., have been perfecting a system by which they make blind landings (see photo). The new system, employs a 3,000 foot length of cable, buried underneath the runway, through which is fed a 500-cycle alternating current. This sets up a magnetic field which is picked up by apparatus in the ship controlling the needles (similar to those used on an airplane's compass). A pilot who is flying blind, by watching the deflections of the needle as his plane approaches the flying field, can locate the runway accurately and come in for a perfect blind landing. The beam that is set up by the electrified cable has an effective range of 9000 feet.



Rudy Arnold

MAGNETIC BEAM: Another one of the blind landing systems that is under current development is the "magnetic beam" system used at the Naval Air Station, Lakehurst, N. J.

DUE AT 15,000 FEET IN 4½ MINUTES...

This new Vultee Vanguard Interceptor Pursuit is on the line ready to go. In a moment a test pilot will climb into the cockpit and head it down the runway and into the sky on another test run. Developed in secrecy and built to rigid specifications, the Vanguard is one of the fastest and most advanced airplanes of its type in the world today. It has the same inherent adaptability to quantity production that is characteristic of the Vultee Valiant Basic and Advanced Trainers, and the famous Vultee Attack-Bombers now serving in the air forces of many nations. In recent months Vultee production facilities have been more than doubled to meet current production demands.

Vultee

VULTEE AIRCRAFT, *Inc*

VULTEE FIELD, CALIFORNIA. CABLE ADDRESS "VULTEE"

TRANSPORT AVIATION

United WAE Merger

WASHINGTON (AVIATION BUREAU)—CAA hearings on application for merger of Western Air Express with United Air Lines are completed and Washington is predicting the Authority will approve it. W. A. Patterson, United's president, testified that Company has no intention of running direct from Denver to Los Angeles, passing up Salt Lake. He said such a move would precipitate a costly competitive dog fight. Of course Salt Lake didn't like the idea either.

It has been agreed that United will give one share for three of Western Air, or $1.66 plus one-sixth share of United for one share of WAE. United has agreed also to take over all WAE employees with seniority rights. First results of the merger, if it is approved, will be through sleeper service on United to Los Angeles, and probably extension of the service from Great Falls to Lethbridge, which eventually would extend to Alaska. This would put United in competition against Pan American Airways, which will operate to Alaska from Seattle.

The merger hearings were speeded up when special examiner Dean Roscoe Pound held a pre-hearing to determine what points are at issue, and swore in all witnesses in a batch. This was done at the suggestion of Welch Pogue, CAA general counsel. The Authority has been criticized for delay. Its rulings apparently have been sound, though, since the city of Newark alone has taken it to court thus far.

More on U.S.-Europe Run

WASHINGTON (AVIATION BUREAU)—CAA hearings on the application of American Export Airlines for a certificate to operate a U. S.-Europe line, and on the opposition of Pan American Airways to the granting of such certificate, were completed, setting a new record in volume of testimony. It will be several weeks before CAA can study the records and make its decision. Meanwhile, odds increased on Export to win. The dope you hear is that CAA would not venture to deny competitive rights provided for in the law; if it did so there would be an immediate drive to amend the Act. The Authority seems to have already made up its mind on the principles involved.

Italy has invited AEA to extend its proposed route to Rome. PAA filed plans with CAA for daily service to Europe, "to meet war-time emergency," asked CAA to set a temporary mail rate for a third schedule to be added to the present two, and called on eight American manufacturers for design of a flyingboat to payload 17,500 pounds for 5000 miles non-stop at altitude speed of 300 mph, to sleep 50 and carry 5000 pounds mail and express. American Export contracted, contingent on getting its certificate, for three huge Vought-Sikorsky boats, service starting at a cost of $2,000,000.

DICK DU PONT, president of All American Aviation, pickup and drop mail system, which has applied to CAA for a route certificate to join the family of regular airlines.

Alaska Airlines

Expansion of commercial airline service in Alaska is regarded as one of the most important problems facing the territory by Ernest Gruening, newly appointed governor. Although Alaska, because of the difficulty of land transport, is intensely air-minded, there is at present no air service between the territory and the states.

All Am. Avia. Applies

All American Aviation has applied for a CAA certificate for four new air pick-up routes in addition to the two it now operates, covering the same general region, and increasing its 58 stations to 125. The two present routes are under Post Office supervision by special act of Congress.

Richard du Pont, president of the company, is asking CAA for early hearings on his application, because the Post Office contract expires May 12. However, the special law sets no definite limit on the experimental period, and presumably it could run on indefinitely. At present the pick-up pouch is hauled in by hand, by a second crew member. The Company is working out an electric motor winch for one-man operation.

United's Cleveland Run

United Air Lines, setting a precedent by increasing service prior to spring, added on Jan. 10 a fourth daily non-stop flight between New York and Chicago. Company gained 76% in revenue passenger miles in December over same month last year. For the first time in company history, December traffic equaled that of November. If United gets the Cleveland-Boston certificate applied for, it will start with two transcontinental flights daily from Boston direct to the West Coast, plus a third schedule to Cleveland and Chicago. Three of the seven DC-3s on order will be delivered late in January; the other four will come in late April. Improvements at the Des Moines airport enabled the company to put down a Douglas there in one schedule each way.

American's New DC-4's

American Airlines on January 10 announced the purchase of $5,317,950 worth of airplanes, which indicates that the flying machine has busted into big business. The order is for 15 4-engined 40-passenger Douglases—largest land planes in the world, says AA's publicity man. Delivery begins early next year. Total horsepower, 4800; cruising range, 2000 miles; tricycle landing with retracting nose wheel; supercharged cabins for low-level breathing; top speed 262, cruising 229 mph at 15,000 feet. Separate lounges for men and women; berths for 22 passengers. Wingspread 117 feet six inches; length 92 feet six inches. This order is in addition to the order for 20-DC-3's placed last fall; deliveries on which will begin about Feb. 1.

FIRST SIX MONTHS of the Philadelphia post office roof-top to airport autogiro mail service has proved a success. Over 1300 flights have been made by Captain John Miller "without incident." Eastern Air Lines is proud of it and will seek for certificates on other jumps.

New Service

A noteworthy service in air transport promotion is being rendered by Erwin, Wasey & Co. of New York City, advertising and public relations counsel for The Air Transport Associa-

tion. The agency has instituted a clearing house of information on commercial flying, and will assist writers and speakers in research problems and in supplying aviation contacts, without charge. Miss Mary Knight, newly appointed Director of Publicity and Public Relations, is directly concerned with the public relations work of the A.T.A., and has a staff of four assistants.

New Haven Bids

New Haven, Conn., hopes to get back on the airline routes within two years as a result of action it has taken to improve its municipal airport. The city Finance Board appropriated $50,000 on Jan. 11 to help pay WPA costs for constructing runways, ramps and other facilities. Additional land of about 140 acres is also being bought.

From The Airlines

Eastern Air Lines last month of operations showed a 70 per cent traffic increase over the last year period. For the first time the company flew more than a million miles in a month. Also, for the first time, it flew more than 10,000,000 passenger miles. President E. V. Rickenbacker announced that his company had negotiated the first agreement between a domestic airline and the International Association of Machinist Aircraft Employees, of AFL.

Best air transport innovation recently is TWA's radio receiver with head-phones for passengers, which the pilot can switch over to his own service circuit. Passengers prefer pilot-station gab to hottest commercials, says TWA's publicity man.

Braniff Airways, Inc. has a stock participation plan whereby ownership of the company would be turned over in considerable degree to residents of the 15 cities it serves. Plan involves the distribution by "invitation" only of 100 share blocks of stock to selected groups in the communities.

T. E. Braniff says that his company is more than pleased with the public response to service with its new fleet of 21-passenger Douglas Super-B-Liners which have been scheduled into regular operation.

Airline Feeder System, which is awaiting a certificate of C & N from the CAA, has been testing a 14-passenger Lockheed Lodestar for service on its proposed lines, which would total 2906 route miles and serve 34 cities in 15 eastern states. Bernt Balchen, of transatlantic fame, is technical advisor to the company.

Penn-Central Airlines is certainly displaying enterprise. What the company didn't tell the world, or anyway this part of it, about those new DC-3s, called the "Million Dollar Capital Fleet," wasn't worth telling. February first was set as the date for extending service between Washington and Norfolk, Va.

AIR INDICATOR TRANSPORT

January 1, 1940

174.13

Which is the ratio of passenger-miles reported by the Air Transport Association for all domestic lines for December, 1939, to the figure for December, 1938. Total for the Indicator has increased greatly over the last month and far ahead of last year. For the first 12 months traffic stood at 677,325,511 passenger miles — up 42.2 per cent.

C. B. MONRO, (right) PRESIDENT OF PENN-CENTRAL, thanks Chairman Robert H. Hinckley of CAA for a speech at a Junior Board of Commerce luncheon in Washington, in which he praised the airline's 13-year safety record.

THIS NUT takes the gamble out of bolted fastenings . . . ***and it is made in types and sizes to meet every aircraft requirement***

A loose bolted connection can let you down like the weak link in a chain. That is why American and foreign airplane builders, and most accessory manufacturers, are protecting important fastenings with Elastic Stop Nuts.

The resilient locking collar in each of these nuts holds nut and bolt thread faces in a pressure-contact that can not be released by vibration, hard service, or exposure to weather. Even when removed and used over and over again, Elastic Stop Nuts retain their full locking effectiveness.

SOUND in principle and manufactured to the highest standards . . . more than 700 different Elastic Stop Nut combinations are now available.

A 56-page Catalog and Data Book contains a graphic explanation of the Elastic Stop principle, presents test and application data, and lists the complete line of nuts • Write for a copy.

ELASTIC STOP NUT CORPORATION
1005 NEWARK AVENUE • ELIZABETH, NEW JERSEY

Elastic Stop SELF-LOCKING NUTS

AVIATION FINANCE

New business received by the aircraft companies continues to outrun production; latest reports show profits for both manufacturing and transport companies trending higher while much new venture capital is sought to finance the rapid growth of the industry that is indicated by reports for 1940.

Beech Aircraft Corp. has in registration 35,651 shares of common stock. Company has agreed to sell a block of 5,000 shares to Tifft Brothers of Springfield, Mass. and Neelands & Platte of N. Y. City at $8 a share and has extended an option to these firms to buy the remaining 30,651 shares at $8 a share. Proceeds would be used to pay off notes of $125,000 and for additional working capital.

N. Y. Stock Exchange has requested all listed aircraft manufacturers to release to stockholders certain financial data including the backlog of unfilled orders at the beginning and end of a given period, new business booked and shipments or sales. The War Department has authorized the manufacturers to furnish this information to the Stock Exchange. The data will pertain to the total business of each manufacturer and not be sub-divided into Army, Navy, commercial or export figures.

The $320,000 financing of Solar Aircraft Co. recently registered consists of 50,000 shares of preferred stock and 100,000 shares of common stock to be reserved against conversion of the preferred.

Vultee Aircraft, Inc. recently made its stock available to the public for the first time through an offering of 300,000 capital shares at $10 a share. Net proceeds will be devoted to expansion of plant and equipment, completion of production engineering and tooling for unfilled U. S. Army orders and to increase working capital for the coming year.

Lockheed Aircraft, figuring importantly among common stock flotations, has registered 225,000 shares of common stock which will be sold at not more than $33 a share to net the company $7,425,000. Of the proceeds some $2,800,000 will be used for two assembly hangars, tools, machinery research laboratory and the development of new models.

American Airlines. By private sale has sold a block of 50,000 shares at $36.50 a share. Net proceeds of $1,810,000 will be used partially to reimburse treasury for $872,187 payments made to retire entire issue of non-convertible debentures held by Aviation Corp.

United Air Lines has received on deposit 70% of the capital stock of Western Air Express under the agreement providing for the sale of the stock to United. The acquisition is subject to approval of the Civil Aeronautics Authority.

Piper Aircraft Corp. estimates its 1940 production will be about 2,500 units of nearly double sales of 1,374 planes in the fiscal year ended September 30, 1939.

With The Aircraft Manufacturers

(from the listings on the N. Y. Stock and Curb Exchanges)

COMPANY	SALES in Millions			NET INCOME			EARNINGS Per Common Share			DIVIDENDS Per Common Share			BACK-LOG In Millions		
	*1939	1938	1937	*1939	1938	1937	*1939	1938	1937	1939	1938	1937	*1939	1938	1937
Aviation Corp.	$3.7	$6.4	$4.0	*d*	$244,909	$479,993	*d*	$0.09	$0.17	....	$0.185	.....	$11.3	$1.2	....
Bell Aircraft	0.2	1.2	1.7	$10,000	65,488	43,241	.....	0.33	0.25	....	.....	.....	7.0	3.7	$1.2
Boeing	10.0	2.0	5.5	*d*	554,958	311,685	*d*	*d* 0.77	0.45	.....	.....	$0.40	26.0	14.9	14.1
Brewster	0.8	1.5	0.7	.....	233,879	19,328	.....	0.66	0.06	$0.20	0.30	0.05	11.0	2.1	1.4
Consolidated	4.8	12.2	11.9	750,000	1,535,110	462,959	$1.00	2.55	0.68	....	1.00	0.50	37.0	2.8	14.0
Curtiss-Wright	49.0	33.1	24.1	5,200,000	3,598,739	1,983,609	0.40	0.17	*d* 0.05	....	.....	.....	160.0	30.0	28.0
Douglas	27.0	28.3	20.9	2,850,000	2,147,392	1,051,778	5.00	3.76	1.84	3.00	3.00	.....	76.0	22.5	31.3
Grumman	4.5	4.9	2.3	750,000	617,074	139,062	1.60	1.30	0.32	1.05	0.75	0.25	4.2	3.5	3.2
Lockheed	35.0	10.3	5.2	3,000,000	442,111	137,919	4.00	0.67	0.21	1.00	.....	.....	46.0	33.3	5.8
Martin G. L.	25.0	12.4	7.8	3,550,000	12,417,417	1,144,858	3.25	2.15	1.32	1.00	.....	.....	50.0	13.9	17.6
No. American Av.	28.0	10.1	8.3	7,200,000	1,904,086	496,103	2.10	0.55	0.14	1.40	0.40	0.125	45.0	10.9	9.3
Republic	1.0	3.6	0.3	*d*	*d* 553,819	*d* 1,210,510	*d*	*d* 0.95	*d* 2.09	....	.....	.....	11.6	0.1	1.3
United Aircraft	50.0	36.8	29.3	9,000,000	5,426,276	3,856,272	3.40	2.05	1.52	2.00	1.25	1.00	135.0	17.5	23.8
Waco	*a* 0.9	0.7	0.9	*a* 4,582	*d* 34,326	*d* 30,214	*a* 0.03	*d* 0.24	*d* 0.21	....	.....	.....	.....	....	....

* Estimated *d* Deficit *a* actual

With the Airlines

COMPANY	REVENUE PASSENGER MILES December			REVENUE PASSENGER MILES 12 Months			REVENUE PASSENGERS December			REVENUE PASSENGERS 12 Months			Revenue Miles 11 Months	Express Lb. 11 Months	Earnings before taxes 11 Months
	1939	1938	% Gain	1939	1938	% Gain	1939	1938	% Gain	1939	1938	% Gain	1939	1939	1939
American	*c20,672	c11,835	74.7	c207,360	c140,869	47.2	53,093	28,947	83.4	541,757	358,295	51.2	c17,231	*c2,415	$1,629,103
Boston & Maine				*2,800	2,257	24.0				a23,429			677	28	*d*3,470
Braniff	2,001	1,356	47.6	19,814	13,504	46.7	6,234	3,974	56.9	62,247	39,023	59.5	3,195	259	55,980
Ch'go & Southern	922	572	61.0	9,242	6,908	33.8				23,500	16,623	41.4	b1,450	*b*93	79,237
Continental				*2,000	1,320	51.1				a5,986			844	15	34,753
Delta				*7,700	5,940	29.6				a26,213			1,436	54	77,737
Eastern	11,584	6,793	71.0	102,904	71,386	44.0	22,929	13,934	65.0	230,243	162,246	43.0	9,863	1,000	815,125
Inland				*2,200	1,140	75.4				a7,985			928	22	25,000
Mid Continent				*4,000	3,379	18.3				a15,096			1,068	51	31,906
National				*2,100	729	18.8				a8,634			644	18	17,700
Northwest	3,140	1,858	69.0	34,770	21,153	65.0				a80,460			4,684	377	327,812
Penna. Central	1,835	1,168	57.0	21,193	15,678	35.1	10,550	6,691	58.0	122,303	85,484	43.1	3,163	526	131,226
T. W. A.	9,448	5,014	88.4	99,621	71,775	38.8				162,618	108,624	49.6	10,900	982	d192,177
United	12,100	6,882	76.0	149,000	108,873	37.0				a262,291	161,000		16,171	2,167	566,736
Western Air				10,496	10,540	24.5				30,007	25,004	20.0	2,079	325	55,699

*Estimate. (*a*) 11 months. (*b*) 10 months. (*c*) last three figures omitted. (*d*) Deficit — 1939 figures are subject to final year end adjustments.

PROFIT & LOSS

Manufacturers Seeking Capital

By Raymond Hoadley

Mr. Hoadley would be happy to answer inquiries regarding the financial condition of the listed aviation companies.

As the rush begins to turn out the huge backlogs of foreign and domestic orders accumulated in the past four months, aircraft manufacturers, in increasing number, are looking to the capital markets for funds to finance plant and equipment expansion and to augment working capital. In addition to unfilled orders now approaching $700,000,000, many companies are negotiating with foreign governments for large orders for delivery in 1941 and in 1940 wherever capacity remains. A large number intend to double delivery rates in the next few months, a few hope to triple production by June. Obviously such an increase in production activity means large cash requirements this winter. Besides the recently announced new financing, it is reported in trade circles that Boeing, Brewster, Piper and possibly Consolidated may be seeking new equity money in the not distant future.

The transport companies will be big factors in the new capital markets in the next year. Another transition stage has arrived, similar to those of 1932 and 1936, when the re-equipment of lines was undertaken in wholesale manner to meet future traffic demands. New equipment, some of which has been under development since 1936, is, or shortly will be available to handle larger loads. The Air Traffic Conference predicts that 500,000 more passengers will be carried on domestic airlines in 1940 than were transported in 1938. Many new routes are likely to be established this year. Some $25,000,000 in new plane orders have been placed for 1940 delivery and bookings running to around $15,000,000 are scheduled for early 1941 shipment. New capital will be required to finance the bulk of this equipment and, if the markets are right, these funds will be secured largely through common stock flotations rather than equipment trust certificates, the time honored favorite method of the railroads.

Pan American Airways probably will be one of the first air transport companies to do a major bit of financing, PAA has a $6,000,000 procurement program under way which it is expected to finance shortly through the sale of over 500,000 shares of treasury stock. Rights will be offered stockholders to buy new stock at a price probably between 65 and 70% of the current market at the time the offer is made. Pan American's net earnings in 1939 are understood to have been the largest in its history, approximating $2,000,000 or around $1.40 a share, in sharp contrast to profits of $46,000 in 1938. The company has experienced a traffic boom on virtually all its routes as a result of the war and increased inter-America trade activity.

Directors of American Export Airlines are also believed to favor the sale of stock rather than the partial use of equipment trusts to secure the $3,350,000 additional funds needed if certificates are issued and mail rates set for the line's proposed trans-Atlantic routes. A plan before the directors calls for the exchange of the 480,000 present shares for 24,000 new shares, warrants to stockholders to purchase 24,000 shares over five years at $27.50 a share and the public sale of 167,500 shares at a net price of $20 a share.

United Air Lines has on order 17 new planes costing about $4,775,000 but, with its cash position approximately $5,000,000, this company does not contemplate any financing. American Airlines, TWA and Penn-Central are among those embarked on equipment programs who may find it desirable later on to capitalize the coming additions to their fleets.

More
AERO ITI-TRAINED MEN
Helping Build America's Planes
PHILIP SHOEMAKER
Aeronautical Engineering graduate now in the engineering department of one of the world's largest manufacturers of transports.
JOHN HALDEMAN
Aircraft Mechanics graduate now helping build huge flying boats used by famous trans-oceanic airlines.
GEORGE KOZELISKY
Aircraft Mechanics graduate in a production division of aircraft plant building a swift new transport.
EARL TURNER
Aircraft Mechanics graduate now with builder of famous attack plane and other military aircraft.
HEBER BRADFORD
Aircraft Mechanics graduate with manufacturer of training planes and other military and commercial aircraft.

Here are only five of over 750 Aero ITI-trained mechanics and engineers who entered Aviation in the last year. They and hundreds more Aero ITI graduates are throughout the industry —working at practically all types of production, maintenance, and engineering duties. The Aviation industry has found Aero Industries Technical Institute a dependable source of competent trained men.

This is because Aero ITI gives the student virtually *advance* experience in the very duties he must perform later. Having followed actual industry methods, and used actual industry equipment, the Aero ITI-trained man readily becomes "at home" on the job, when he enters the industry.

Descriptions of courses sent on request

EXECUTIVE BOARD

JOHN K. NORTHROP
President, Northrop Aircraft, Inc.

C. A. VAN DUSEN
Vice-Pres., Consolidated Aircraft Corporation

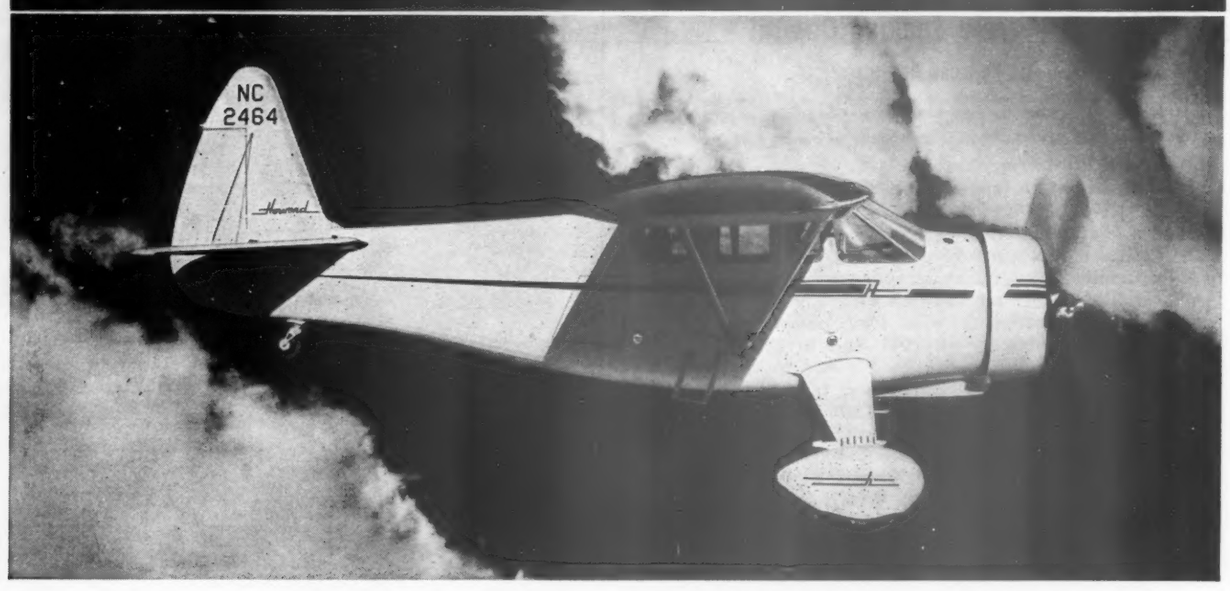
ROBERT E. GROSS
President, Lockheed Aircraft Corporation

These leading Aviation industry executives supervise the policies and operation of the Aero Industries Technical Institute.

Aero Industries Technical Institute
5261 West San Fernando Road, Los Angeles, California

Five Courses In
AIRCRAFT MECHANICS and AERONAUTICAL ENGINEERING
Offering U. S. Civil Aeronautics Authority Approved
12 Months Aircraft Mechanics Training

Howard



The new Howard, Model 15, powered with Jacobs 330 HP engine

THE HOWARD MODEL 15—*Superior in Performance, Construction and Flight Characteristics*

Professional and private pilots who fly or have flown the Howard unite in declaring that it is the best performing and smoothest flying cabin plane in its class.

•

New Models Now in Production

The new Model 15 re-emphasizes Howard's superior merits, offering even better performance with numerous improvements and refinements that add to the comfort and pleasure of pilot and passengers.

The current issue of *Howard Aircrafter* illustrates and describes the new Howard in detail. It will be sent to you on request.

Specification and Performance Data

Elsewhere in this Directory Issue will be found detailed specifications and performance data on the new Howard equipped with various powered engines. Compare it with other ships in Howard's price-power-capacity group. Note Howard's wing loading factor, load carrying capacity without sacrificing performance, and its adaptability to every potential use.

Howard Superiority Flight-Proved

Thousands of hours of cross-country flight under all conditions by factory and owner pilots conclusively prove that the Howard *actually rides and flies better* than anything in its class! Let us prove it to *you,* by a demonstration flight.

★ ***A Better Ship for Business Builders***—A Howard more truly conserves executives' mental and physical energy. A Howard injects new forces into business, creates added opportunities and helps to attain new goals. Inquiries from executives and organizations interested in a Howard are cordially invited—write for the *Howard Aircrafter.*

HOWARD AIRCRAFT CORPORATION

5301 WEST 65TH STREET • CHICAGO, ILLINOIS

AVIATION OPERATORS CORNER

The Cavalcade

Big news in January for operators, as well as for light plane manufacturers, was the success of the cavalcade to Florida. By actual count 645 ships were at Orlando on their way down and unofficial figures at the end of the maneuvers claimed a grand total of 750 airplanes had reached Miami. Many of these ships had plowed through snow and ice on their way to the sunny south.

The maneuvers this year were the most popular on record and should arouse great interest in private flying. There is a lot of ammunition for operators to use in the fact that some 700 ships, most of them in the light plane class, casually flew cross-country from all points east of the Rockies and actually got to their destination many hundreds of miles away. This is proof that airplanes will take you there and back.

Most exciting event of the three days meeting was the finish of the Macfadden Trophy Race. H. C. Rankin, flying his Beechcraft in from St. Louis, won first prize of $3,000 and the trophy. Second money was captured by Russell Holderman who flew a Lockheed 12 from Roosevelt Field. Third honors went to Bill Cason in a Beechcraft which he flew from San Antonio. Nine pilots finished the race. Ken Olson won the Dominican Trophy for taking first place in the Sportsman Pilot's race.

Richard B. Holt

PART OF THE AIR ARMADA AT MIAMI. They were all there—big and little—composing the greatest airplane style show in history.

WHEN A BEAUTY QUEEN OF AN AIR MEET really knows how to fly—that's something! Ruth Shelley was voted "Miss Miami Aviation" and promptly stepped out of the usual beauty's role by learning to fly.

A unique four-way tie-up between an operator, a large oil company, a plane manufacturer and a science museum is taking place these days in the New York City area which may interest a number of operators. The program is called, "Wings for America" and the participants are Carl Evers of Floyd Bennett Field, Standard Oil Company of New Jersey, Luscombe Airplane Corp., and the N. Y. Museum of Science and Industry. All seem delighted with the program's success.

In the museum, one of the country's most progressive, a section has been set aside for aviation displays. Ten times during the day and evening a lecturer talks about various phases of aeronautical work. As there is a Link Trainer which is demonstrated at each session, a full-sized Luscombe and plenty of other equipment, the lecture has lots of interest. At the close of each session a drawing is held and two winners are offered free flights with Carl Evers, Luscombe distributor. Those who don't win are given a chance to buy an introductory flight at the reduced rate of $1.50. All who take flights are made members of "Essowings" and may get a $15 reduction in the cost of flight training given by Evers.

The program started last June first and up to the present more than 2,300 persons have become Essowings members and taken flights. More than 300 flights have been paid for by individuals who did not win free trips.

About 45,000 people attended lectures at the Museum and a total of 4,008 flights were won in the first seven months. About half of the winners actually went out to the field to take advantage of the flight offer. Of persons taking flights, 50 signed up for a course of lessons with Evers, and 32 actually took instructions. At this writing about half have completed the course. Evers uses four Luscombe ships for his work.

If you stop in at the Reading, Pa., airport these days you're likely to see the Bowers' Beechcraft swooping in and out. Bowers bought the ship to fly firm officials and customers from Reading to the Chicago factory and to sales offices in Boston, Columbus, Baltimore and Kansas City. H. C. Hastings is pilot.

The Southern Nevada Aero Club has brought new interest and activity to that part of the country in recent months. A successful air show was staged at Las Vegas, Nevada, just before Christmas. Planes were flown in from Nevada, California, Utah and Arizona. Local merchants helped to underwrite the cost of the show by providing gasoline for the contests and prize money for the winners.

Some 5,000 interested spectators came to watch the goings-on. Hawley Bowlus put on a sailplane exhibition, Troy Colboch amazed the visitors with his parachute jumping and

H. C. RANKIN FLEW HIS BEECHCRAFT to Miami fast enough to win top honors in the Macfadden Trophy race. Left to right: Rankin, Bernarr Macfadden, Walter Beech. Walter has a right to be in this happy picture because his ships won two of the first three prizes.

TAGGING THE BASES

with LES NEVILLE

Youth Will Be Served

Youth will be served in many ways by the several recently devised plans to encourage aviation training of the right kind. Shell Oil has backed up the C.A.A. Flight Training Program with $15,000 worth of scholarships and awards to be administered to participants by the Institute of the Aeronautical Sciences. Air Youth of America is getting underway on its educational program which includes encouragement of model building and other junior aviation activities in schools, and clubs throughout the country. Scripps-Howard Scholarship winners are hard at work in universities and colleges throughout the land. These and other similar activities are wise investments not only in the future strength of the aviation industry but in coming generations of our citizens.

Bird lovers get a kick out of watching sparrows flit around hangars, looking for a place to build their nests, but fixed base operators who have to keep their equipment presentable wish their feathered friends would find other homes. William R. Kent and Freddy Lanier of Southern Air Services have solved the problem by adding to their personnel a "coon" named George, who went right to work and cleared the hangar in a week. And the birds don't come back while George is patrolling the rafters. He is marked down on the payroll for a salary of one bottle of chocolate milk per day.

From the Light Plane Cavalcade comes another story about our feathered friends. This time it's a little red hen. J. A. West of Washington tells us that he passed the night with the Marty Jensens at Charleston, and was about to drop his bag into the baggage compartment of his Lenape powered Cub in the morning, when something flashed into his vision. It was the little red hen about to lay an egg in the compartment. So there was nothing left to do but delay the take-off until the egg-laying was completed or lose Mrs. Jensen's friendship. While waiting Mr. West learned that the Jensen chickens lay eggs in most unusual places, such as drill presses, pistons, etc.

there were numerous races, spot landing and bomb dropping contests.

A ground school has been established by the Aero Club with free courses being offered in several subjects.

Down in Ranger, Texas, there is more activity than the airport has seen in years. With C. J. Moore looking after things, the airport has been improved and lighting equipment installed. Russell Miller has opened a flying school and has a fine bunch of students, including the C.A.A. group from Ranger Jr. College.

Roy Taylor has leased part of Municipal Hangar at Meecham Field, Ft. Worth, where he has set up a sales and distribution office for Aeronca. This gives him plenty of space for plane storage and Ft. Worth will be the delivery point for north Texas. Mr. Taylor is District Manager for Aeronca and has built a new office for his business.

Good news for soaring pilots came out of Los Angeles last month when a new firm, Bowlus Sailplanes, Inc., was launched. William Hawley Bowlus, designer and well-known glider pilot, heads the new concern. With such potent industry names as Douglas, Gross, Northrop, Millar and Frye as backers, prospects for the new organization look bright. The firm already has a plant in operation and promises a production of 15 sailplanes a month. Rate of production should bring lower prices.

REPORT CARD

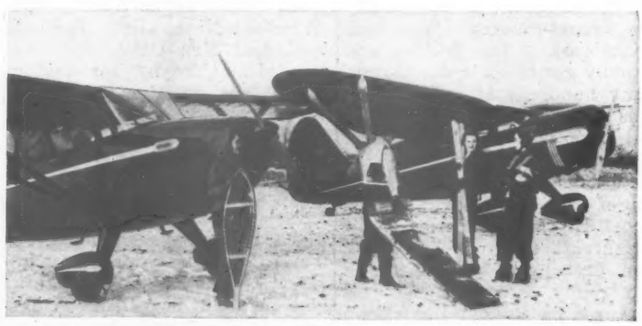
Of Air School

Col. Roscoe Turner is busy these days getting his new flight and ground school established at the Municipal Airport at Indianapolis. From his lengthy experience in all phases of aviation, the Colonel is stressing the practical nature of the training his organization offers. We predict that the magic of Roscoe Turner's name, plus the fact that jobs are waiting for trained men these days, will soon fill the school to capacity. In our December issue we inadvertently reported the school to be in Kansas City. That is Col. Turner's old stamping grounds, but the school is located in Indianapolis.

One of the busy flying schools of Louisiana is the Southern Aviation School, managed by a woman, Edna Gardner Kidd. She operates five ships, including a Ryan ST equipped for instrument flying. The school is located at Shushan Airport.

Some 24 lucky students will be admitted to a new airline mechanics training course to be started at once by United Air Lines at its Cheyenne, Wyoming, maintenance base. The course will run for three years. Candidates must be high school graduates between the ages of 18 and 25 who have had at least one year of aviation in a government approved school, or its equivalent. Training will include theory and practice.

Foreign students continue to be attracted to the Ryan School of Aeronautics at San Diego. In recent weeks two students have come from Sweden, two from the Philippine Islands, and others from Venezuela, Mexico and Canada.



SNOW HOLDS NO TERROR for private owners these days. If you are a ski fan and want to get up to your favorite mountain top for a week-end of skiing you are not held back by a slow and cumbersome ski train if you have a ship. Stinson obligingly shows how it can be done. On the left, the 3-place 105, and on the right the five-passenger Reliant.

Harvey Stevens and glider friend with three Bowlus sailplanes such as will be produced in the new California plant of Bowlus Sailplanes, Inc.